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The DENTAL Journal OF AUSTRALIA

Annie Praed Oration

A. J. Arnott, D.D.Sc. (Syd.), F.D.S., R.C.S. (Eng.), F.A.C.D., F.I.C.D.

The Dean of the Faculty of Dentistry within the University of Sydney, Professor A. J. Arnott, was invited by the Executive of the Australian Dental Association, New South Wales Branch, to deliver the first Annie Praed Oration on 16th October, 1951, in the Great Hall, University of Sydney.

The following is the text of his address:

Mr. President, Distinguished Visitors, Ladies and Gentlemen:

I am indeed very conscious of the honour which the Australian Dental Association (New South Wales Branch) has bestowed, by inviting me to deliver the First Annie Praed Oration.

This Oration commemorates the life and work of Annie Praed, who played a conspicuous part in the advancement of dental science in this State.

Dr. Praed commenced her studies at the University of Sydney with the first group of undergraduates in the Department of Dentistry, and in 1906 she was admitted to the degree of Bachelor of Dental Surgery.

After thirty-two years of private practice, Annie Praed submitted a thesis entitled "The Problems of the Excessively Resorbed Alveolar Ridge" in support of her candidature for the degree of Doctor of Dental Science. The examiners reported that the thesis was an original contribution of distinguished merit, adding to the knowledge of the science of prosthetic dentistry and the Senate, in 1938, granted the degree of Doctor to Annie Praed at the age of sixty-five years.

Dr. Praed maintained a keen interest in the affairs of the Australian Dental Association, and in the development of the Dental Alumni Society of the University of Sydney. Her devotion to the duties of a teacher in the Faculty of Dentistry is well known to the profession of dentistry. In the immediate post-war years, she came again to the assistance of the Faculty and, as a part-time Teaching Fellow, passed on her knowledge to the large number of ex-servicemen and women who entered the Faculty.

It was obvious to her colleagues that her health was failing rapidly in 1948, yet she elected to carry on the work she loved. Just prior to her death in December, 1948, I endeavoured on several occasions to persuade her to retire from her active duties.

Invariably her reply was, "I prefer to carry on while I am able to be of service to the Faculty."

Dr. Praed always found additional time in order to give special attention to the women students in the Faculty.

The wealth of her experience was readily tendered to them in a gentle and affectionate manner and, in this way, she endeavoured to mould the professional career of her students. The sorrow caused by her death was shared by her colleagues on the teaching staff and the student body as well as by the patients under her care.

The Doctorate robes she wore on ceremonial occasions are held in trust at the University of Sydney to be handed over, at her request, to the next woman graduate to be admitted to the degree of Doctor of Dental Science within the University of Sydney. Thus her mantle will fall on the shoulders of another woman graduate and, no doubt she hoped hereby to inspire another person to continue her work of outstanding service to the community.

Yes, indeed, Annie Praed was truly a remarkable woman and certainly a most distinguished graduate. It is fitting that her life and work are commemorated by this Oration.

THE HISTORICAL DEVELOPMENT OF DENTISTRY AS A PROFESSION IN NEW SOUTH WALES.

To-night my task is to trace the development of the profession of dentistry in New South Wales. I believe that the birth of the profession occurred on the 1st of January, 1901, when the Dentists Act of 1900 became effective in New South Wales. Prior to 1901 there were no set rules governing the practice of dentistry in New South Wales. Anyone could set up a practice, although it is only fair to state that it was considered advisable to obtain a few hints from another person already established in practice.

However, there were some dentists from England established in practice in New South Wales prior to 1900, and they laid the foundation of the dental profession in this State. It is true that dentistry in New South Wales owes its beginning to English techniques, which were brought here by dentists from the Old Country. These dentists worked hard to establish a profession here, and the first real reward for their efforts came in the year 1900 when the government of the day passed legislation dealing with the affairs of dentistry.

When the Dental Act came into force in January, 1901, about one thousand persons were registered as dentists, and they were permitted to take apprentices or pupils for which, in return, they received premiums. The apprenticeship system remained in force until the legislation of the Dentists Act, 1934, when the system was abolished and the University of Sydney was recognised as the training centre for students of dentistry.

Again in 1901, a committee of the Senate of the University of Sydney was appointed for the purpose of completing the arrangements for the opening of a Dental School. Later, a Department of Dental Studies was established with the Dean of the Faculty of Medicine as the Head. At first the curriculum extended over a period of three years, and the successful candidates were granted a License in Dentistry. The School of Dentistry was opened in March, 1902, with seventeen students in the first year of the course.

At the same time in 1901, the University Dental Hospital was established for the purpose of providing dental attention for persons unable to pay normal dental fees, and also to provide facilities for the instruction of the students attending the University Dental School. The business of this Hospital was carried on in a building at the corner of George and Bathurst Streets, opposite St. Andrew's Cathedral. A Dental Hospital of Sydney was also established in 1900 to provide dental treatment for members of the community unable to afford private dental treatment.

The University Dental Hospital and the Dental Hospital of Sydney were amalgamated by Act of Parliament in 1905 to form the United Dental Hospital of Sydney and later, in 1910, occupied a new building on the present site in Chalmers Street, Sydney.

Meanwhile in 1905, the Senate of the University established the curriculum for the degree of Bachelor of Dental Surgery, extending over a four years' course. Those students who already had completed the three years' course for the License in Dentistry, were invited to continue for a further year in order to qualify for admission to the degree of Bachelor of Dental Surgery. Several of the students complied with this arrangement and in 1906 the first candidates were admitted to the degree of Bachelor of Dental Surgery. There were thirteen candidates, including Dr. Frank Marshall, for many years afterwards lecturer and examiner in Prosthetic Dentistry, and also the late Dr. Annie Praed. The complete list of the first thirteen candidates to be admitted to the degree of Bachelor of Dental Surgery is as follows:—

1. Margaret Estelle Barnes.
2. Harold Henry Bond.
3. John Houghton Bradley.
4. Frederick Richard Crouch.
5. Alfred Pearson Berkeley Dolan.
6. Howard Gordon Hardie.
7. Edgar Alexander MacTaggart.
8. Frank Marshall.
9. Cecil George Moxham.
10. Bevan Walter Neave.
11. Annie Praed.
12. John Norman Starkey.
13. Leslie George Stockwell.

The dental mind had started to move in the right direction of placing the study of dentistry on a high plane.

Here I wish to record the work of the late Sir Thomas Anderson Stuart, then Dean of the Faculty of Medicine and Chairman of the Board of Dental Studies. The University, the dental profession and the community owe so much to him for his vision and energy while controlling the destiny of the dental profession in this State. In order to briefly yet concisely illustrate the development of dentistry that he had in mind, I quote from an address Sir Thomas delivered at the Opening of the First Australian Dental Congress held at the University of Sydney in 1907. He was then controlling the development of the Department

of Dentistry within the Faculty of Medicine, and his remarks dealt with the development of the Dental School.

"Where will it end? It should end with the conferring of the degree of Doctor on those who deserve it and in the creation of a Dental Faculty with its own Dean, sitting in the seats of the Mighty."

This prophecy has been fulfilled for, in 1921, the Faculty of Dentistry was established and later, in 1928, the first candidate was admitted to the degree of Doctor of Dental Science within the University of Sydney.

Richard Fairfax Reading became the first Professor of Dentistry and Dean of the Faculty of Dentistry in 1921. The first Dean of the Faculty, loved and respected by all his students, worked in concert with Sir Thomas Anderson Stuart in the early development of the Dental School. He was associated with the early development of the Dental School as part-time Director of Dental Studies and later filled the Chair of Dentistry with distinction. After qualifying for his professional career by obtaining the degrees of Medicine and Dentistry at the Royal College of Surgeons, England, he commenced practice in Sydney in 1889 and, with some of his colleagues, laboured to establish the Dental School in 1901.

Reading was a modest man. His actions and his words always denoted a man of culture. All the students who passed through the Dental School from 1901 to 1934 well remember the stern, majestic figure of the first Dean of our Faculty who, nevertheless, possessed a twinkle in his eyes which frequently belied the terseness of the decision he was bound to make on certain occasions.

During the years of 1924 to 1934 as Superintendent of the Dental Hospital I was privileged to work in close contact with "Dick" Reading. I found him to be a wise counsellor and a very staunch friend, blessed with a delightfully keen sense of humour.

When Reading retired in 1934 he turned his active mind to the management of his property at Grenfell, near Forbes, in New South Wales. We met by design at regular intervals until his death in 1941, and on each occasion the topic of conversation revolved around the Dental School and, in particular, the achievements of the graduates. In the eventide of his life he was able to view with satisfaction the results of his strenuous work done in order to build up the profession of dentistry in New South Wales. His life and achievements will remain fresh in the memory of all his students during their professional career. The Faculty of Dentistry is grateful to this great man in dentistry. Thomas Carlyle said, "All things that we see standing accomplished in the world are properly the outer material result, the practical realization and embodiment of thoughts that dwell in the Great men sent into the World."

While dental education at the University was progressing in the desired manner, the dental political atmosphere was still clouded by the presence of advertising by some dentists and by the existence of the apprenticeship system as a means of qualifying for the State Board Examinations.

The Dentists Act, 1934, eliminated advertising and abolished the apprenticeship system in dentistry. It is only reasonable to state that, during the development of our profession, the pupilage system served its purpose. Certainly such a method of training has no place in our community today when such excellent facilities exist at the University for the proper tuition of students of dentistry.

I know I should be silent concerning advertising in dental practice. This practice is now moribund and it is hoped will remain so for all time. It is of interest to note, however, that the dentists who advertised welcomed an Act of Parliament that made them ethical practitioners by the law of the land. Glittering signs, illuminating grateful and cheerful patients, gazing with pride or maybe pleasure at a pair of forceps grasping a perfectly shaped molar just extracted, disappeared overnight. So did the numerous large notices denoting the superior skill of the dentist, and the reasonable charges he made for his services. The devil's wheel, so described by members of the public, disappeared from the shop window displays. This contraption was fabricated from hundreds of teeth, extracted from various patients. I do not know whether or not the patients concerned denoted their consent to the constant display of part of their anatomy to the general public! I do know, however, that the many practitioners who are developing the science of preventive dentistry, would shudder at the sight of such wanton waste of the important members of the dental arches.

Many thousands of pounds were spent each year by some dentists on advertising in various ways, including regular notices in the daily press and other publications. The President of the Association formed by the "advertising" dentists said to me at the time of the impending legislation to abolish advertising, "We will welcome an Act of Parliament that will affect all that engage in this practice of advertising, because our overhead

expenses will be considerably reduced." So there was little, if any, opposition to the legislation and the practice of advertising in dentistry disappeared.

It can be truly stated that the Dentists Act of 1934 has contributed largely to the development of the profession of dentistry. Seventeen years have passed and this Act has endured the test of practical application thus shedding great credit on those responsible for such far-sighted legislation.

During these years of development of our profession, dental research stumbled along a very difficult path of progress. The main deterrent to the development of a research programme is, of course, the provision of the necessary funds to carry out the projected work.

The first effort to obtain financial support was made by the Dental Undergraduates' Association of the University of Sydney in the year 1921. Three final year students, Dr. T. M. Lloyd, Dr. H. G. Jones and myself, ventured forth to seek some source of revenue for research in dental science. We, naturally, decided to approach the late Mr. Bosch, of Bosch Barthel and Company, a dental supply establishment in Sydney. Now Mr. Bosch was a somewhat eccentric person and in our wisdom we decided to time our visit at an hour of the day midway between breakfast and the luncheon period. At five minutes to ten, on a certain morning, we were ushered into his office and propounded our scheme. The reception was excellent and a promise practically obtained when suddenly Mr. Bosch indicated a notice suspended on the wall of his office: "Breakfast at 10 a.m." The rest of this story is now history. Dentistry did not directly benefit from the magnificent gifts of money this successful benefactor later donated to the University of Sydney.

Later, in 1934, some success was achieved when the Minister for Health of the day, the late Mr. Weaver, authorised the building of research laboratories at the Dental School. His interest in dental research was activated by the fact that he suffered personally a chronic ailment of the jaws which took some time to cure. Meanwhile, he was forced to carry on the onerous duties of a Cabinet Minister. This energetic man could not tolerate the then slow recovery and repair of a condition of osteomyelitis of the mandible. He queried the decision for masterly inactivity as far as surgical intervention was concerned during the acute stage of the condition. "Why not remove the area forthwith?" he asked. The blunt reply indicated that the lack of adequate support for research brought about a delay in the rapid cure of certain lesions. The Minister then said, "The Government will provide the funds for the erection of a dental research laboratory provided that there is little delay in effecting the necessary details." Needless to say, the laboratory was rapidly built at the Dental School, and I am happy to say the Minister also enjoyed a rapid and normal recovery from his ailment.

The Australian Dental Association (New South Wales Branch) and the Walter and Eliza Hall Trust entered into an arrangement with the Senate of the University of Sydney whereby the salary of a dental research scholar could be met. Some funds were also obtained to provide a moderate amount of equipment for the first Dental Research Scholar, Dr. R. M. Kirkpatrick, to commence his work.

A further effort was then made to effect an approach to the Federal Government through the then Member for South Sydney, Mr. J. T. Jennings, Snr., who also was director of a dental supply house. Mr. Jennings willingly consented to raise the matter of support for dental research in the Federal House, and he was supplied with the necessary data for inclusion in his remarks. A brief telegram, received from Mr. Jennings following his submissions, stated, "Good progress. Read the report of proceedings." The Minister for Health of the day, none other than the Right Honourable William Morris Hughes, in reply, stated that he would certainly give careful consideration to the need for the provision of sufficient finance to enable the development of dental research. He added that he would make a further statement at a later date. Some time later the Minister stated that, following further representations made, he intended to recommend to Cabinet the provision of funds for medical research and the establishment of the Medical Research Council. Applications for financial support for dental research could then be made to the Medical Research Council.

Again dental research obtained some recognition and it is indeed satisfactory to realise that the foundation of the Medical Research Council was accelerated by the claims made for the urgent need for dental research facilities.

The period of hostilities naturally slowed down the progress of research activities at the Dental School. When the immediate post-war period came, approval was obtained to appoint a Director of the Departments of Pathology and Bacteriology and, in July, 1946, Dr. N. E. Goldsworthy, a distinguished scientist, took up his duties.

Very soon it became evident that, in order to prepare the way for the expansion of an active dental research organisation in New South Wales, an Institute of Dental Research with its own budget should be established. In August, 1946, the Institute of Dental Research was founded by the Board of Control of the United Dental Hospital, and with the approval of the Hospitals Commission of New South Wales.

Meanwhile, plans were conceived for the accommodation of the Institute of Dental Research on the Seventh Floor of the new Dental Hospital when completed. In August of this year the Institute occupied several of the laboratories and offices incorporated in the building programme which should be finalised in approximately two years hence.

Dr. N. E. Goldsworthy, the Director of the Institute, recently visited research organisations in the United States of America and the United Kingdom. It is stimulating to learn that the Director is of the opinion that the final accommodation and laboratory facilities for the Institute of Dental Research in Sydney will compare more than favourably with those of the foremost dental research organisations he visited overseas.

I do not hesitate to state that the Institute of Dental Research will have a distinct influence on the further achievements of dentistry as a profession in New South Wales. The Faculty of Dentistry is fortunate to enjoy a close liaison with the Institute and already the instruction it is bound to present to the students of dentistry has considerably benefited by the high standard of work done within the Institute of Dental Research.

In the Second Annual Report of the Institute of Dental Research, 1948, Dr. Goldsworthy referred to the Final Report of the Interdepartmental Committee on Dentistry, Ministry of Health, Department of Health for Scotland, 1946, and I quote a few lines:

"Research work of high quality requires in the first place men and women with the gift and will to undertake it; the second need is that such men and women should be enabled by all means to put their gifts to the most effective use."

The work of the Institute of Dental Research is of national importance because it has a direct influence on the health of our people. Let us strive at all costs to render this national service in the realm of preventive dentistry by maintaining positive pressure on the button which controls the "green light" for the progress of dental research right here in Sydney.

When the United Dental Hospital was opened in Chalmers Street, Sydney, in 1910, the first real effort was made to organise clinical teaching to dental students in New South Wales. The usual problem of finance confronted those responsible for this important step in dental education. In the early days of the Hospital's existence, a meagre staff was maintained to provide dental treatment for persons of humble means and clinical instruction for the students in dentistry. This staff mainly consisted of honorary dental surgeons who gave freely of their time and experience to the Dental Hospital. The Superintendent of the Institution, however, was a full-time officer.

As a student of the period 1918 to 1921, I was privileged to study at the Dental Hospital during part of the period of the superintendence of Dr. Percy Chater Charlton. The Superintendent then and, in fact, until 1934, was expected to devote the major portion of his working hours to the instruction of dental students. In some obscure manner he was also expected to control the affairs of the Hospital as well as to give treatment to the more difficult and serious dental conditions of the patients. Furthermore, he was called upon to develop and supervise the various clinics within the Hospital. Dr. Charlton covered all this ground with surprising agility and enthusiasm. In addition, he was responsible for the intensive practical training the students obtained during the period 1914-1924. Tall, and most dignified in stature, possessed with a cheerful and kindly disposition, Charlton was always to be found instilling confidence and knowledge into the minds of his grateful students. In his youth Dr. Charlton was prominent in the realm of sport, particularly in the fields of tennis, boxing, golf and cricket. As a cricketer he achieved great success as a member of the Fifth Australian Eleven which visited England in 1890. After graduating at Harvard University in the United States of America he obtained additional qualifications at the Royal College of Surgeons, England and Glasgow.

It can readily be seen that Dr. Charlton was endowed with the attributes of scholarship, dignity and sportsmanship which established his status of a distinguished teacher and member of the dental profession.

Today, at the age of 85, Dr. Charlton, owing to failing health, is unable to take an active part in the affairs of the dental profession. Last week, Mr. President, he telephoned to ask me to apologise for his absence this evening. I feel sure that I express the thoughts of his colleagues when I say that the dental profession on this occasion is proud to record

with grateful thanks the distinguished services rendered by this eminent dental surgeon.

Many stories are told from time to time about the "old" Dental Hospital, but I believe the students of yesterday remember more vividly the strong characteristics of their teachers.

Mr. A. B. A. Palmer, affectionately referred to as "Joe," was responsible for the clinical and laboratory instruction in Prosthetic Dentistry from the inception of the School of Dentistry until 1944. He was able to instil the required degree of practical skill even in those students who did not profess ability in this subject. Does not the memory reach back to those chairside clinics or laboratory demonstrations? Some statements regularly made by Palmer were: "Come, gather around men!" and "Remember, the excess of the material causes the ultimate trouble." Again, many students have watched with awe his habit of writing or drawing on the cuff of the sleeve of his immaculate white shirt in order to illustrate some technical point.

Mr. Palmer always impressed his students by his ability to demonstrate his technical skill. Apart from Prosthetic Dentistry, Palmer continually used his hands to fabricate many intricate devices that called for precision in manufacture. The engine of a motor car provided in his spare time scope for his unusual dexterity. His kind attitude of mind prevented the punctual arrival at a destination when travelling by motor car. He would spend hours, if necessary, assisting a motorist discovered to be in some trouble with his automobile on the highways. Today Mr. Palmer lives in quiet retirement but no doubt his active mind frequently recalls his work at the Dental School and, in particular, the students who benefited so much at his hands.

The reputation of the Dental School in Sydney forged rapidly ahead owing to the unstinted service rendered by the teaching staff. Reference must surely be made also to the loyal members of the general staff of the Dental Hospital who entered into the spirit of the development of the dental profession. These people worked long hours and received comparatively small remuneration for their services. It is not possible tonight to refer to them individually, although their work richly deserves such recognition.

However, there is one man I must mention who, behind the scenes, played his part in the development of our Dental School. I refer to the late Mr. Percy Edridge, remembered by his work as Caretaker of the Dental Hospital. Every student during the period 1923 to 1948 came in contact with Perce and derived considerable benefit from his timely advice and help from day to day. Edridge loved his work at the Dental Hospital and loyally trained the students to observe the regulations necessary to produce efficiency. An unselfish soul, he strove to fashion the careers of young men and women who had the opportunity to enter a profession which privilege did not come his way in his earlier life.

Students who were required to work in the evenings at the Hospital in order to construct dental splints for patients who suffered fractures of the jaws always enjoyed an invitation to supper and the cheerful company of Perce and his kind wife. It is rumoured that on some occasions Edridge even cast the splint for the student who was frustrated by previous failure in this technique.

On duty most of the hours of the day and usually late into the night, Perce Edridge never failed to answer any summons to duty at any hour. Patients received first aid treatment while the arrival of the dental officer on duty at night was awaited.

As Superintendent of the Hospital and later as Dean, I was privileged to enjoy the friendship of this modest and most loyal servant of the Dental Hospital.

With the progress of dental science greater demands were made on the Dental Hospital and the need for the rapid expansion of the institution became evident. The period of the financial depression undoubtedly brought the work of the Dental Hospital before the public and the Government. Here I recall the vivid cartoons frequently spread over the pages of the daily press. One artist depicted a young man who, through the ravages of dental disease, was forced to have his teeth extracted and some apparent years later he arrived in a wheel-chair quite senile for his appointment to have impressions taken and dentures completed.

In 1935 a move was made to establish a new building for the Dental School with modern arrangement of the clinics and equipment. The building programme was planned in two stages, namely:—

1. The study and development of ideas obtained from existing dental schools in foreign countries.
2. The construction of the existing building according to the planned programme of development.

Just at the time that the existing building was completed in 1939, the shadow of war was suddenly felt throughout the world and the thoughts of British people turned to the survival of our Empire. During the period of

hostilities the Faculty of Dentistry concentrated on the training of dental students for national service. Then in the immediate post-war years came the need to conduct refresher courses for ex-service dental officers and to face up to the work of training a large number of ex-service men and women desirous of entering the profession of dentistry.

The teaching staff of the Faculty have done and are carrying out magnificent work in training so many students with success.

Today the Board of Control of the United Dental Hospital of Sydney, aware of the progress and the activities of the Faculty of Dentistry and in the true spirit of complete co-operation, embarks on a further building programme for the Dental School. This building programme involves extensions to the existing building in Chalmers Street, which have been approved of by the Government of New South Wales. The estimated cost of this project is in the vicinity of £600,000. The building, when completed, will comfortably accommodate 400 students. At the present time the number of students in the Faculty is 504. In the immediate post-war years the figure rose to 771. However, it is estimated that 400 will constitute the student body in the near future and this figure may again increase in 1953.

The establishment of a Department of Preventive Dentistry will be part of the new building programme now being carried out at the United Dental Hospital of Sydney.

The objects of this Department of Preventive Dentistry are:—

1. To develop the science of preventive dentistry by putting into effect the knowledge gained from the work done by the Institute of Dental Research at the Hospital and by similar dental research units throughout the world.
2. To provide improved facilities for the practical instruction in preventive dentistry (including orthodontics, periodontia, pedodontia and nutrition) to the students in the Faculty of Dentistry of the University of Sydney.

By the application of this recent knowledge with respect to prevention and by the use of modern techniques in the control of dental caries, most patients can be brought from early childhood to adult life and beyond with a full complement of healthy teeth.

The research worker is shedding light on the effect of nutrition on teeth, the relationship between malocclusion and the incidence of dental caries, the methods of controlling dental caries, the tests for dental caries susceptibility and many other dental problems. The science of preventive dentistry practice develops the plan of treatment derived from the experience and knowledge gained from this dental research work.

The Department of Preventive Dentistry will house a large clinic for children with examination rooms, X-ray and processing rooms, dietitian's room, chemical laboratory and a children's waiting room, especially furnished, as well as an area to be used for the instruction of children and mothers in the practice of dental hygiene.

It is further anticipated that the Department of Preventive Dentistry will closely co-operate with the Baby Health Centres and the Day Nursery units in Sydney.

Now, Mr. President, during these years of activity involving the growth and expansion of the Dental School, the organisation of a dental research programme, the improvement in dental legislation and the development of a public dental health service, the members of the dental profession worked to establish complete harmony among the dental practitioners.

Prior to 1927 various dental societies existed in Australia. In the State of New South Wales there were no fewer than five organisations. I can recall the following dental associations:—

The Odontological Society.

The Society of Dental Science.

The Dental Association of New South Wales.

The Sydney University Dental Graduates' Association.

The Master Dentists' Association.

The formation of an Australian Dental Association with branches in each State of the Commonwealth of Australia was always in the minds of many members of the dental profession.

The first definite move in this direction occurred in New South Wales in 1927 when the New South Wales Branch of the Australian Dental Association was formed.

Immediately an approach was made to the two main dental societies in New South Wales to transfer their funds and interests to this newly-formed branch of the Australian Dental Association. The Society of Dental Science immediately agreed to the proposal and finally completed the transfer of its assets and wound up its affairs in June, 1929. The Dental Association of New South Wales did likewise in August, 1930.

Here, however, I pause to indicate that this noble decision and action by the Dental Association of New South Wales undoubtedly decided the future success of the Australian Dental Association. It simply indicated that the dental profession at long last had united in a determined effort to carry out its work of national service to the community.

The Honorary Secretary of the Dental Association of New South Wales, the late Mr. A. W. Cleary, was an Irishman who was ever ready to do battle for the dental society he served. He worked for his organisation with loyalty and with simple yet determined devotion. Cleary practised his profession in Surry Hills but it is only right to state that the major portion of his life was devoted to the affairs of his Association. One evening in 1929 Dr. F. Marshall and myself decided to call on Mr. Cleary and seek the absorption of the Dental Association into the new body, the Australian Dental Association, New South Wales Branch. Frankly we did not feel too confident of the end result of our efforts nor did we at the time realise the mental stature of this gentleman who had for years battled so forcibly in the field of dental politics. We were received with great courtesy and there was surprise evident in Cleary's voice when he said, "Enter, gentlemen, and may I say this is the first occasion that members of the dental profession from Macquarie Street have visited me in Surry Hills." Quickly I reminded Cleary that my professional duties were mainly confined to Surry Hills, in fact, at the Dental Hospital in Chalmers Street nearby. We discussed the purpose of our visit for several hours and, finally, Mr. Cleary said, "I believe in the formation of one dental association in Australia, and I am prepared to call a special meeting of the members of the Dental Association of New South Wales in order to give serious consideration to the proposals."

He did this and the members of that body decided to liquidate the Dental Association and pass over the assets of the Society to the new body. It is obvious that Cleary was the driving force behind this important decision and so he had the distinguished honour of fostering the formation of this branch of the Australian Dental Association by his unselfish and ready support.

As Organising Secretary of the New South Wales Branch of the Australian Dental Association and Business Manager of the *Dental Journal of Australia*, Mr. Cleary continued his valuable service to the profession of dentistry and the community until his death in 1935.

While the dental profession in New South Wales was in the process of forming the local branch, a successful effort was made by delegates of the several States in Australia to establish a parent body. Two delegates from each State of the Commonwealth met at Canberra in June, 1928. The Constitution of the Australian Dental Association was adopted and on 20th June, 1928, the first meeting of the Federal Council of Australia was held at Canberra under the chairmanship of the late Mr. W. R. Parker, of Queensland.

Today the Australian Dental Association with a branch in each State of the Commonwealth of Australia flourishes as an organisation which disseminates dental knowledge to the profession and the community and maintains harmony among its members.

Before the Australian Dental Association was established efforts were made to bring the profession together by the occasional conduct of congresses in Australia. This procedure is now maintained by the Australian Dental Association and congresses are held in selected States of the Commonwealth of Australia at regular intervals, with the exception of the recent war period.

The First Australian Dental Congress was held in Sydney in February, 1907. The Opening Ceremony of this Congress took place in this Great Hall of the University. The late Dr. A. Burne presided, and the Colonial Secretary, the Honourable James Hogue, formally opened the Congress. *Inter alia* Mr. Hogue said, "A few moments ago I was speaking about the methods employed by the old school of dentists. So it was with the old school of physicians and I think that, up to the present day, the first thing he does is to feel your pulse. Then he will say, 'Let me see your tongue, if you please.' To our mind our medical advisers might go a little bit further and say, 'Let me have a look at your teeth.' A person's health largely depends upon perfect mastication which can only be effected by good teeth." These remarks by the Colonial Secretary in 1907 vividly demonstrate to us the marked progress the professions of Medicine and Dentistry have made in the last forty years.

This First Australian Dental Congress was, according to the records, a marked success. In any event, the Convention indicated the need for such a gathering of professional men who must derive considerable benefit from the interchange of ideas and the assimilation of knowledge. Congresses since that year of 1907 have been held in Melbourne, Adelaide, Brisbane, Sydney and Perth, with the exception of the war periods and during the earlier years of the "depression" period.

The Ninth Australian Dental Congress held in Sydney in 1937 is recorded in the history of dentistry in Australia as a truly remarkable achievement. Although the success of a congress of this nature is brought about by the combined efforts of all who take part in the proceedings, nevertheless, the President of the Convention must be prepared to devote much time and energy in the preparation for and the carrying out of such a project. A President of forceful character and untiring energy, Sir Harry Moxham, directed the affairs of this most successful Congress. Sir Harry for many years had served his profession with the aim to improve the status of dentistry in New South Wales and Australia. The climax of his achievements occurred in 1937 when he, displaying his well-known vim and vigour in no uncertain manner, established the status of the dental profession so cherished now by all members of the profession.

Again in 1950 the Twelfth Australian Dental Congress was held in Sydney. Again the Opening Ceremony of the Convention was conducted in this Great Hall of our University. On this occasion Dr. J. V. Hall Best was the President. John Hall Best is one member of the dental profession who could have readily selected another profession with equal assurance and success! Endowed with a keen sense of humour and a deep appreciation of the need for positive effort in order to obtain success, Dr. Best guided the destiny of the Twelfth Australian Dental Congress. This Congress was unique because the members of the profession in Australia and from overseas were brought together under circumstances which denoted the closest attention to modern concepts of dissemination of dental knowledge.

The Symposium on Dental Caries held in the Wallace Theatre at the University of Sydney was followed by an exceptionally well-organised programme of lectures and clinics in the various branches of dental science.

By courtesy of Amalgamated Wireless (Australasia) Limited, televised clinics in Oral Surgery were conducted at the Dental Hospital and every member attending the Convention had the opportunity to witness the various surgical techniques in great detail. The innovation of televised clinics sheds light on the modern concepts of this outstanding Convention. This leads me to say that I am convinced that dental practice in Australia is always abreast of the modern developments throughout the entire world.

Well, the Twelfth Australian Dental Congress is now history, but the important result is the stimulus to other States of the Commonwealth to at least emulate the indeed high standard established by this Convention of 1950.

The knowledge and understanding of dental science advance rapidly day by day and there exists the distinct need for every practitioner to be conversant with the developments of dental science.

The Faculty of Dentistry, conscious of the importance of post-graduate education, recommended to the Senate in 1947 that post-graduate classes in dental science be established for the profession of dentistry. The Senate of the University approved of the recommendations submitted and the Faculty then established the Post-Graduate Committee in Dental Science for the promotion of post-graduate education, study and research in dental science.

The first course in Orthodontics commenced in 1948. This course was followed by courses in Inlays, Anaesthesia, Prosthetic Dentistry, Periodontia, Crown and Bridge Work, Preventive Dentistry, Oral Surgery and General Anaesthesia. Already sixteen courses have been conducted and gradually all branches of dental science will be included in the scope of the post-graduate sessions.

Every effort will be made to keep the post-graduate teaching in line with the development of the Institute of Dental Research so that research methods and the results of dental research will be included in the post-graduate programme.

The post-graduate plan includes the following features:—

1. The establishment of post-graduate courses in particular subjects for members of the profession who desire intensive training in practical subjects in the field of dentistry.
2. The establishment of post-graduate courses to provide training in the various branches of dental science in preparation for the practice of a speciality.
3. The provision for graduate study for graduates desiring to qualify for higher degrees within the University.
4. The establishment of adequate library facilities essential to post-graduate study and research. Already there is a library in existence and this library contains textbooks and works of scientific importance. Current dental journals in English and some in foreign languages are regularly received. In addition, other scientific periodicals of value to add to the knowledge and understanding of dental science are on the subscription list.

5. The formation of special laboratories, clinic rooms for post-graduate work, and the gradual acquirement of suitable equipment.
6. The inclusion of extra-mural lecturers and clinicians in the post-graduate teaching programme.

The Post-Graduate Committee in Dental Science is at present framing the programme of study for 1952. Each year it is anticipated that the scope of post-graduate study will be expanded in order to develop gradually a Post-Graduate School in Dental Science controlled by the Faculty of Dentistry within the University of Sydney.

The main purport of my remarks tonight is to indicate the rapid advancement of dentistry to the high professional status it now enjoys in the realm of national service. The broader outlook of including the fundamental sciences as the basis of the dental curriculum is largely responsible for this satisfactory development of a greater service to humanity.

The formation of the Dental School at the University in 1901 coincided with the birth of our profession in New South Wales. Since that year the curriculum has been carefully planned to enable the students of Dentistry to acquire the fundamental knowledge of the biological sciences essential for the practice of preventive dentistry.

It cannot be denied that prevention of dental disease must start with the child, indeed, with pre-natal attention. Otherwise we have the unhappy picture of the ravages of dental disease, even before the formative and early life of the child is over. The profession is now confronted with the need for an organised approach to the practical application of the science of the prevention of dental disease.

The establishment of the Department of Preventive Dentistry at the Dental Hospital, already mentioned, is a distinct forward approach to the problem. It is realised that this Department will form the nucleus of organised treatment hitherto neglected in our community. The Department will have close liaison with the Institute of Dental Research in order to apply and develop the preventive measures already accepted in dental science. The students in the Faculty of Dentistry will have further opportunity to acquire the knowledge of the practical application of the science of prevention of dental disease. The post-graduate programme will include sessions for members of the profession so that they, in turn, may be conversant with this important phase of their professional work.

While our attention is focussed on the birth and rapid development of the profession, we pay homage to the memory of all those who, by their foresight, laid its foundation. The members of the dental profession today must defend and preserve the inheritance passed on to them by those who discharged their duties with such distinction.

We have recently observed the simmering of an effort by some persons to lower the status of our noble profession. Suffice it to say that the dental profession in New South Wales has a national duty to observe and fulfil no matter what sacrifice is entailed. In simple words, this duty is to defend the trust imposed upon us by the eminent men who served their profession nobly, wisely and so well.

Here as we assemble in this, the Great Hall of our University, we must sense the atmosphere of the spiritual home of our profession of dentistry.

Since 1901 fifty years have passed and during this period over one thousand graduates have been admitted to the degree of Bachelor of Dental Surgery in this Great Hall. Indeed, there are several graduates who have attained further academic distinction by receiving the degrees of Master or Doctor.

The thoughts of many graduates present this evening will revert back to the hours spent in working examination papers in this Great Hall. Many will remember the occasions when the brain has more readily functioned following a study of the beautiful lofty hammer-beam roof of this imposing Hall. Sometimes again the eye would wander to the large stained windows representing the founders of the Colleges at Cambridge and at Oxford; or perhaps the large stained glass window in the north-west recess on the dais containing portraits of the kings and queens of England from William the Conqueror to Queen Victoria.

Visitors to the Great Hall cannot fail to be impressed by the portraits of celebrities in History, Literature, Science or Art of the past; or by the portraits in oil of those who have rendered distinguished service to the community which include Chancellors, Vice-Chancellors, original Members of the Senate, Registrars, Professors and Benefactors of this, our University.

The beauty in design of this Great Hall, the largest and most dignified of its kind in the Southern Hemisphere, creates an atmosphere

which symbolises the University and its place in our cultural pursuits. Yes, indeed, Mr. President, it is within the precincts of this Great Hall that the profession of dentistry finds its spiritual home! May we, the members of the dental profession, present in this Great Hall tonight, resolve to discharge our duties with credit and with the will to preserve and defend the trust that has been handed down to us by the forefathers of the profession we serve in this great country of ours!

The Problem of Impacted Teeth in Orthodontics*

Kenneth T. Adamson, D.D.Sc. (Melb.).†

An impacted tooth may be defined as one which is wedged between the jaw and another tooth or one which is firmly fixed in the jaw. Such teeth are frequently encountered during the treatment of orthodontic cases; many are due to the premature loss of deciduous teeth, but others occur as the result of abnormal growth and developmental processes, and it is with the latter group that this paper is concerned. These include: Maxillary cuspids, mandibular third molars, maxillary first permanent molars, second deciduous molars, maxillary central incisors, and second bicuspids.

Although sporadic articles have appeared in the literature from time to time dealing with various phases of this question, no attempt has been made to consider the problem as a whole. It is the intention of this paper to summarize our knowledge of the subject, and to discuss it from a practical aspect.

It seems preferable to deal with the least common first and to devote more time and detail to those which are more usually encountered.

Second Deciduous Molar.

We will commence with consideration of the impacted 2nd deciduous molar, which begins with an ankylosis of the tooth to the alveolar bone. (Fig. 1.)

The clinical signs of this are an apparent descent of the tooth into the surrounding gum tissue. In reality the affected tooth is actually standing still while the surrounding teeth and tissues are growing up and surrounding and enveloping it. Ankylosis is due to infection or trauma, but in many instances the activating cause passes quite unnoticed by the patient or even the dentist. These teeth are not impacted in their early stages but, when neglected, they are finally enveloped by the tissues and are completely hidden from view by a forward movement of the first permanent molar which tips forward into the area normally occupied by the second deciduous molar, thus impacting the tooth completely.

Fig. 1.—Model showing usual appearance of ankylosed deciduous molar.

Fig. 2.—Radiograph of patient referred to in figure 1. In this case the second bicuspid is congenitally absent.

If allowed to progress to the stage described above, the impaction of the tooth is frequently accompanied by the loss of much of the surrounding alveolar bone. The prognosis for the teeth on either side is not good as bone destruction is often sufficient to expose the gingival portion of the roots of the neighbouring teeth to such a degree as to make their retention difficult. Figure 3 illustrates this condition and in addition a gross displacement of the second bicuspid.

The treatment must be of a preventive nature, in that an ankylosed molar should be

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noted immediately and removed at once. It should never be allowed to reach the advanced stage where the tooth itself is finally impacted

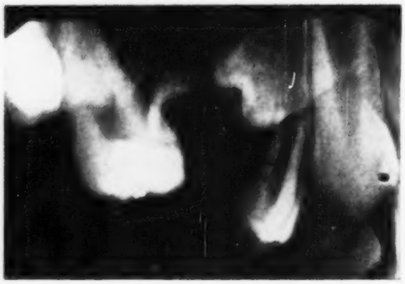

Fig. 3.—Radiograph showing chaos as a result of retaining an ankylosed deciduous second molar.

by the first permanent molar. The removal of the ankylosed tooth should be followed by the insertion of a simple space retainer to maintain room for the permanent tooth to follow.

Maxillary Central Incisors.

When an upper central incisor fails to erupt it is usually because of:—

(a) The presence of one or more supernumerary teeth overlying the crown of the tooth.

(b) Injury or trauma in the early formative stages.

(c) A thickening or fibrous condition of the gum tissue overlying the tooth.

The first step is to X-ray the affected tooth or teeth. This will disclose the presence or absence of supernumerary teeth, or a deformity of the tooth if trauma has occurred; if neither of these conditions is present, the last mentioned condition should be suspected.

If a supernumerary tooth (Fig. 4) or teeth are present they should be surgically removed if possible, although at times a single supernumerary tooth may be so deeply placed and so near the midline as to be in close approximation to the anterior palatine vessels and nerves. In such cases there is a certain reluctance on the part of oral surgeons to undertake their removal (Fig. 5), and it may be necessary to wait and see whether the supernumerary tooth will erupt to a more favourable position. In these circumstances it is advisable to make a space retainer to prevent closure of the space which the erupted tooth should occupy.

When a supernumerary tooth or teeth are removed, the central incisor will usually erupt spontaneously, and opportunity should always be given for this to take place. In those cases in which it does not, steps must be taken to bring it into place. This will be discussed later under the heading of "Impacted Cuspids."

Fig. 4.—Supernumerary teeth preventing the eruption of a central incisor.

Fig. 5.—Showing supernumerary teeth deeply placed in midline.

If the tooth is deformed as a result of trauma there is no alternative but to remove it as the crown is usually at an angle to the root and the tooth is useless.

Where a hard fibrous condition of the gum is present, the removal of the gum overlying the tooth crown will in many cases produce spontaneous eruption. Such a case was reported by Reich[1] and figures 6 and 7 show the case before the gum tissue was removed and afterwards.

First Permanent Molars.

It is not uncommon to find maxillary first permanent molars (on one side or both) impacted with the mesial marginal ridge jammed underneath the distal of the second deciduous molar (Fig. 8). It is the writer's opinion that this is one of the surest signs of general lack of growth and development of the arches, and occurs mostly in those cases where there is a

marked discrepancy between tooth size and basal bone. If left untreated these teeth will eventually force the second deciduous molars

Fig. 6.—Unerupted upper left central incisor before removal of hard fibrous tissue.

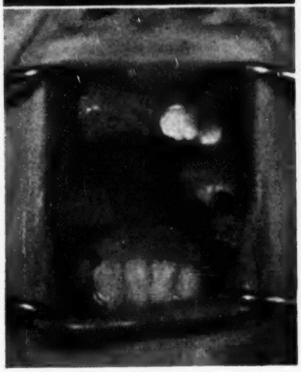

Fig. 7.—Same case after removal of tissue over left central incisor.

into supra-occlusion, thus interfering with occlusion generally and possibly producing an open bite. The distal root of the second deciduous molar is usually eroded in the process. (Fig. 9.) On the other hand, if the second deciduous molars are removed to allow the eruption of the first permanent molars and no care is taken to prevent the closing of the space thus created, the first permanent molars will migrate forward with amazing rapidity and the space will be lost in a few weeks. So rapid is this forward migration of the first permanent molars under such conditions that special care is needed in devising a space retainer. The following technique has been found to be satisfactory:—

A maxillary impression is taken and the model cast. The second deciduous molars which are causing the impaction are then cut off the model with a knife, and by careful observation it is possible to judge the position of the mesial surface of the partially erupted

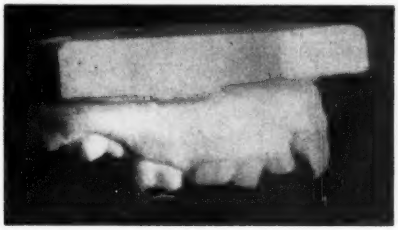

Fig. 8.—Model showing upper right first permanent molar unable to erupt. Its mesial surface is caught under the distal of the second deciduous molar.

first permanent molar. A space maintainer is then made in the form of a small denture with the necessary stabilising clasps, one of which is placed immediately in front of the partially erupted first permanent molar on either side so that it will prevent its mesial movement but not its vertical eruption. (Fig. 10.) When the plate has been processed, it is forwarded to the dentist with instructions that immediately after removal of the second

Fig. 9.—Unerupted six-year molar eroding distal surface of second deciduous molar.

Fig. 10.—Clasp on mesial surface of six-year molar to be attached to small denture to prevent mesial movement.

deciduous molars causing the impaction, the plate be inserted and the patient told to wear it constantly. By this means all the space available is maintained and no mesial migration of the first permanent molar will occur during the process of eruption.

Second Bicuspids.

Most impacted second bicuspids are due to premature loss of deciduous teeth which has allowed the first permanent molars to migrate forward in the arch, so partially or totally eliminating the space which should be available for these teeth. It is not the purpose of this paper to discuss such impactions. We shall, however, refer to those bicuspids for which there is plenty of space but which for some reason or other fail to erupt.

Fig. 11.—Distal displacement of bicuspid during development.

Firstly there is the type illustrated in figure 11, which during the developmental process became displaced markedly distally. This is most frequently seen in lower second bicuspids, with the result that one finds them impacted underneath the mesial surface of the first permanent molars. It would seem at first glance that some traction force would be necessary to bring these teeth into place, but the writer has found that the removal of a small amount of bone on the mesial of the crypt sufficient to expose the tooth crown will cause these teeth to move away from underneath the first molar and eventually erupt into the mouth. On some occasions it has even been observed that one can move the tooth crown in the crypt and yet the final process of eruption proceeds normally. A word of warning must be issued that when this process of bone removal is carried out it is necessary to make a space retainer to prevent the first bicuspid which is just mesial to the space from tipping distally, as has occurred in the case illustrated in figures 12 and 13. This was the first case treated in this way. In cases done since then, in which space retainers have been used, there has been no tendency for this distal movement of the first bicuspid to occur.

A rare type of unerupted bicuspid, which can scarcely be classified as "impacted," is illustrated in figure 14. This particular case

Fig. 12.—Eruption of distally displaced bicuspid after removal of bone on mesial surface of crypt.

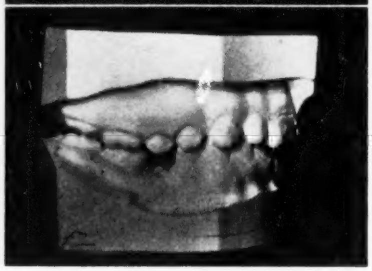

Fig. 13.—Distal movement of the first bicuspid which must be prevented by use of a space maintainer.

was a Class I with distorted pre-maxillae from thumb-sucking. The X-rays showed all teeth present in their early stages. The labial position of the upper anteriors was corrected with a removable appliance, and as the overbite was normal no further treatment was thought to be necessary provided that the remaining permanent teeth erupted normally. All of them did except the mandibular left second bicuspid, and after waiting for twelve months the patient was referred to the dentist with a request for the removal of the mandibular left second deciduous molar. The dentist did this but felt a hard bony condition underneath the tooth instead of the soft tissue or partially erupted tooth which he might have expected to find. He took a further X-ray which revealed the tooth crown to be completely encased in a cyst, and the prognosis was considered doubtful. The patient was referred to an oral surgeon for an opinion, who decided to open up the cystic condition, expose the tooth crown, and remove as much of the cyst wall as possible. From that time on the erup-

tion proceeded normally, and the present condition of the tooth is shown in figure 15. It is anticipated that sufficient bone growth will occur to enable the patient to retain the tooth.

The lesson we can learn from this case is that with young patients it is always worthwhile to give Nature a chance.

Fig. 14.—Unerupted bicuspid.

Fig. 15.—Eruption of bicuspid proceeding normally after removal of cystic condition around crown.

THIRD MOLARS.

The most interesting and most discussed tooth possessed by man is undoubtedly the third molar. Dentists are constantly considering either the question of extracting this tooth or of preserving it. Unfortunately in the majority of cases the impacted third molar is brought to the patient's attention only as an accomplished fact. A general survey of literature on the subject indicates that most cases of impaction are due to insufficient space for eruption and the orthodontist has been blamed for causing a great number of these impacted third molars. Of course there is the type which has the occlusal surface of the crown facing lingually and which will never erupt no matter how much space is provided for it. Even allowing that this is so, it would seem that more careful study should be given to a consideration of the causes which have brought about this want of space.

There is no possibility of our spending sufficient time in this paper in examining this important point, but in the opinion of the writer, the orthodontist should not regard a case as completed unless he is certain that the third molars of his patients will have sufficient room to erupt normally, and if such is not the case he should make adequate suggestions as to how the condition can be overcome.

At this point the paths of the oral surgeon and the orthodontist must cross, because the problems of both regarding third molars are inseparable. One might say that many cases of impaction might be prevented by adequate early orthodontic correction of what were at the time simple malocclusions. It may also be argued that many cases of aggravated malocclusion might be aided by the timely intervention of the oral surgeon in removing impacted third molars.

One of the greatest problems concerning both in regard to this question is at what time can it be definitely decided that third molars will become impacted? Lucien Brun[2] says it is impossible to predict before the adult development whether or not erupting third molars will be impacted, because human growth has no fixed schedule and the time of this development must be considered as variable and this is strongly supported by Broadbent.[3] On the other hand, it has been stated that no posterior growth occurs in the mandible (and probably the maxillae) after the complete eruption of the second molar, by which time there will either be sufficient space provided for the wisdom teeth or there will not. We know that the eruption of the second molar is also variable, and no age can be fixed for this; it varies from one patient to another. In other words the diagnosis of impacted third molars is governed more by maturation of the individual than by chronologic age.

The writer is of the opinion that one can determine at a reasonably early age the prognosis for an unerupted third molar and suggest appropriate steps if impaction is suspected.

In listing the indications for the early removal of impacted third molars, one can do little better than use the summary by Bowdler Henry[4] in regard to indications for the early removal of the mandibular third molar, which he gives as follows:

"(a) In early cases, before calcification of the third molar, when the crown of the second molar is crowded against the root of the first molar and when the third molar crypt is sharply tilted behind and above the second molar and crowded upon it. (Fig. 16.)

(b) At a later stage, after calcification of the cusps, when the orientation of the crown of the third molar is seen to be abnormal, in either a mesio-oblique direction or in a lingual direction, especially when there is further evidence also of molar crowding on the second molar, which is being pressed under the posterior convexity of the first molar. (Fig. 17.)

Fig. 16.

Fig. 17.

Figs. 16 and 17.—Impacted third molars indicating extraction.

(c) When the molar teeth, and especially the third molar, are abnormally large.

(d) When the mandibular third molar is of normal size but the maxillary third molar is abnormally small or congenitally absent.

(e) When the third molar is grossly deflected by a supernumerary tooth.

(f) When through the early loss of the deciduous molars, the first and second molars having tilted forward, it is proposed to push them backward in order to allow the first and second premolars to erupt into their proper places."

It is suggested, however, that no matter how skilfully the operation of third molar removal is performed it must at best provide the patient with a very uncomfortable few days, and that at times it is possible to remove the second molars and allow the third molars to come into place. This must be differentiated from the technique of removing second molars to simplify the removal of the third molars. Hillin[5] is somewhat critical of this technique in his article "Indications for the Removal of Impacted Third Molars at an Early Age."

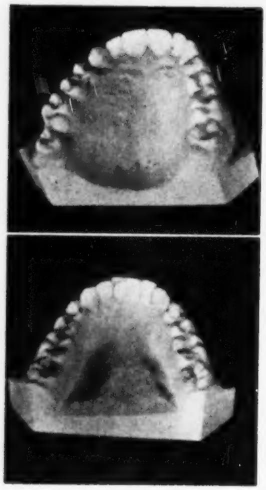

Fig. 18. — Models of case showing effect of removing second molars.

If we examine the photographs shown in figure 18 which show the third molars in place in the mandible after the second molars have been removed, I think you will agree that this can be satisfactorily accomplished, and there is no doubt that there is much less discomfort for the patient. There are certain points which must be carefully watched in carrying out this procedure. One is the angulation of the third molar; if this is tilted beyond an angle of 30° to the distal surface of the second molar there is little chance of its righting itself before it erupts into the mouth, in which case it will still be impacted behind the distal of the first molar, as is shown in figures 19 and 20.

Secondly, there must be no suggestion whatever of a lingual deflection which definitely interferes with the eruption of the third molar, sometimes preventing it from coming through altogether, and sometimes causing it to erupt at such a lingually inclined angle as to make it impossible to get it into place without elaborate orthodontic procedure. Figure 21 shows the types which are ideal for the removal of second molars to allow the third molar to erupt.

Fig. 19.

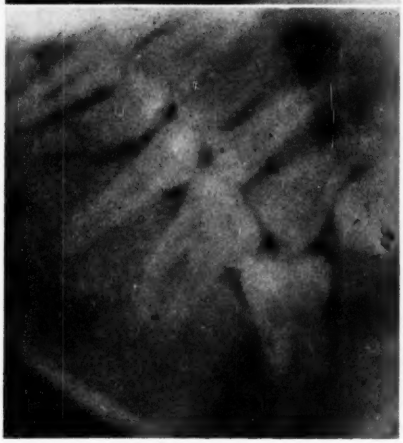

Fig. 20.

Figs. 19 and 20.—Radiographs of impacted third molars where the angle of inclination is greater than 30° to the distal surface of the second molar. There is little chance of these teeth righting themselves before erupting into mouth.

It is the orthodontist's duty to his patients to make sure that he provides for adequate space for the eruption of the third molar teeth. This can only be done by a careful survey of the case from the point of tooth size in relation to basal bone. If he considers that there is insufficient room he should not discharge the case until, in co-operation with the oral surgeon and employing any of the means suggested above, he has prevented impaction of third molars occurring. This not only contributes to the comfort of patients, but also adds greatly to the stability of the final result.

Fig. 21.—Radiograph of third molar. Ideal type for removal of second molar to allow third molar to erupt.

Maxillary Cuspids.

These are found to be impacted more frequently than any other teeth with the exception of the third molars. They differ in that the third molars are usually impacted at the finish of treatment, whereas maxillary cuspids erupt at an age when orthodontic treatment is in progress. It does not come within the scope of this paper to discuss the advisability or otherwise of bringing these teeth into the arch, but the author would like to endeavour to present a classification of these teeth which he feels may simplify some of the difficulties which are usually associated with the above process.

Various methods have been employed from time to time for producing the eruption of these teeth. Bennett[6] removed the overlying soft tissue and bone and exposed the crown as much as possible; gutta percha was then packed into the cavity between the bony wall of the crypt and the crown of the tooth and kept in place for several days. The tooth thus freed from gum tissue, and aided by some pressure from the gutta percha, slowly moved down into position. This method proved applicable to the more superficial types of

unerupted canines, but was quite useless for those more deeply placed.

Strock[7] exposed the tooth crown in the same way, fitted over it a small celluloid form filled with a paste made of camphor, metacrin, petrolatum and white wax. The celluloid form was forced well over the tooth and changed every week for a month. At the end of that time he claimed it was possible to decide whether the tooth would come down itself or whether it would require some orthodontic adjustment.

Gwinn[8] advocates exposure of one surface of the tooth crown, it may be the labial or the lingual, and *all of the incisal edge.* He then packs the cavity with a dressing made of zinc oxide three parts and powdered resin one part with eugenol as a liquid, and leaves this in place for four or five days. He finds that it protects the wound, relieves inflammation and, what is most important, prevents the tissues from closing over the wound. He claims that

Fig. 22.—Radiograph taken from one angle shows unerupted cuspid in a more or less vertical position.

Fig. 23.—Radiograph taken vertically downwards reveals the true position of the unerupted cuspid.

any unerupted maxillary cuspids treated in this way will erupt by themselves in an average time of eighteen months. If orthodontic traction is necessary he bends up a flat coil of soft heavy brass wire, one end of which forms a hook, and cements this on to the tooth. He does not apply any traction until a period of eight weeks or so has elapsed, by which time some evidence of spontaneous movement should be present.

Fig. 24.—Unerupted upper canine.

Fig. 25.—Model of case in figure 24 after pinning and manipulation of tooth with elastic traction and fixed appliance.

Other writers have advocated drilling a small hole in the tooth after surgical exposure and cementing a small gold pin into the hole, the pin and the hole in the tooth having been previously threaded. Thus further fixation is supplied for the pin, not only by cementing it into the tooth but by screwing it in as well. This method has the advantage of providing a positive control of the tooth from the start. However, it requires very careful handling and death of the pulp can result if the pin is badly placed. It has also been stated that decay may occur round the hook, but the writer who has used this method many times has never had this experience.

In considering the advisability or otherwise of manipulating unerupted cuspids into the arch, it is necessary to determine their exact location, and to do this one must have complete X-rays. An X-ray in one plane is of little value and can be misleading. In fact it

probably accounts for the mistakes made by dentists who extract a first bicuspid to allow a cuspid to erupt which is wedged against the lateral and apparently vertical, but which in reality may be almost horizontal (Figs. 22 and 23).

figure 27 however, we see that an X-ray taken from above shows the tooth to be nearly horizontal when compared with the bicuspids.

Fig. 26.

Fig. 27.

Figs. 26 and 27.—The angulation of the radiographs is important in determining the correct inclination of the unerupted tooth.

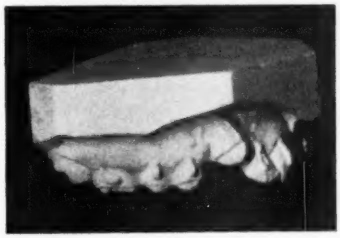

Fig. 28.—Model showing position of erupting upper right canine indicates that radiograph gives the correct angulation.

This is borne out by its position as it emerges through the gum and is finally ready for banding. (Fig. 28.)

Impacted cuspids may be arbitrarily divided into three groups, according to their approach to the horizontal position.

Fig. 29.—Unerupted upper canine.

Figure 24 illustrates the result of this procedure without taking adequate X-rays. Figure 25 shows the tooth in place but not before months had passed, during which the tooth was pinned and manipulated into place with elastic traction and fixed appliances. Figures 26 and 27 also illustrate this point.

In figure 26 the impacted cuspid appears more or less in the same plane as the lateral although approaching it at an angle. In

Group 1. Those in this group may be either labial or lingual in relation to the incisor teeth, and approach nearest to the vertical position; the greater percentage is lingual. When lingually placed they are very slightly deflected from their vertical position, with the root apex lying more or less in its correct position, and the tip of the crown in close approximation to the lateral incisor root or crown. (Fig. 29.) A tooth of this type is the simplest to bring into position, and will always

erupt spontaneously if the tooth crown is surgically exposed as described by Gwinn. (Fig. 30.) The only exception is the rare case in which the tip of the cuspid crown is so close to the lateral that it cannot be freed from bone without damaging the lateral. (Figs. 31 and 32.)

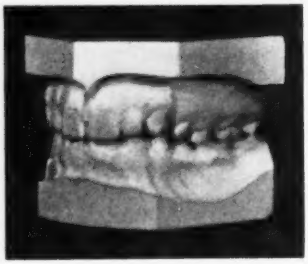

Fig. 30.—Model showing result of treatment by the method of Gwinn.

Group 2. These are more deeply placed on the lingual side with their root apices slightly distal of normal and the incisal tip may extend to a position level with the mesial surface of the lateral crown. (Fig. 33.) Some of these will erupt as a result of surgical exposure, but those more deeply placed will require positive traction. (Figs. 34 and 35.) If the wound can be made to heal with the permanent

Fig. 31.

Fig. 32.

Figs. 31 and 32.—Unerupted canines impacted against the laterals in such a position that the canines cannot be freed from the bone without damaging the laterals.

Fig. 33.

Fig. 33. — Unerupted canine which may erupt after surgical exposure.

Fig. 34.

Fig. 35.

Figs. 34 and 35.—Deeply placed unerupted canines requiring positive traction.

exposure of the tooth crown, some simple form of attachment such as the wire coil may be employed, but if the tooth is so deeply placed that this is a difficult procedure the writer still prefers the pin set into the tooth.

Fig. 36.

Fig. 37.
Figs. 36 and 37.—Deeply placed upper canines never erupt spontaneously after surgical exposure but require positive traction.

Group 3. Those which are to all intents and purposes completely horizontal on the lingual of the upper incisors. Here the root apex lies as far distally as the first bicuspid area, or may even extend beyond. The incisal tip of the crown of the unerupted cuspid lies behind the upper central incisor and may even approach the midline. (Figs. 36 and 37.) Most of these are deeply placed and some lie almost in the floor of the nose. It is the writer's experience that unerupted cuspids of this type will never erupt spontaneously as a result of surgical exposure, and that they can only be brought down by positive traction applied from a pin set firmly into the tooth on to which is soldered a small series of weenies or eyes. As the tooth moves down into position and more and more of the pin is exposed each eye is successively cut off, thus shortening the pin and preventing it from

Fig. 38.

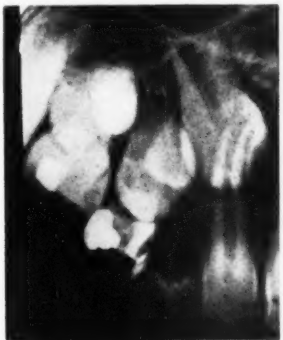

Fig. 39.
Figs. 38 and 39. — Labially placed unerupted upper canines.

irritating the tongue. Such pins in their initial stages are one-quarter inch in length. The manipulation and final eruption of all unerupted cuspids in this third group is not a practical proposition, either from the patient's or the orthodontist's point of view.

All those cuspids in Group 2 will need further orthodontic treatment to bring them finally into place in the arch even after they erupt, for unless their axial inclination is correct they will never stay well placed in the line of occlusion.

The rare type of impacted cuspid which is labially placed to the incisors is sometimes hard to locate because if deeply placed and lying well under the thickened soft tissues, it is deflected at the lip sulcus and it is impossible to detect any bulging of the labial plate.

However, there is usually marked labial displacement of either the lateral or both the central and lateral, depending on the position of the cuspid, which makes their detection more or less positive. (Figs. 38 and 39.) Gwinn states that in his opinion it is impossible to bring these into place, because one cannot fully expose the crowns surgically, and secondly it is impossible to employ adequate means of traction without lip irritation. This of course is one of the greatest objections to correcting misplaced cuspids in the mandible, where any form of traction usually irritates the lip or the tongue.

Summing up the position in regard to impacted cuspids, provided they do not fall into Group 3 most will erupt spontaneously as a result of surgical exposure, the exception being those in which the tip of the tooth cannot be exposed because of its proximity to neighbouring teeth. Where direct traction is necessary a simple type of force application may be employed provided that the wound may be made to heal giving permanent exposure of the tooth crown. If there is any doubt about this method it is preferable to set the pin into the tooth, but if this is done great care must be taken to avoid the pulp.

Finally, it is hoped that the points raised in this short paper will stimulate a discussion which will help to elucidate the many problems which we meet in this particular section of orthodontics.

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Planning Observations with Special Reference to Dentistry*

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Introductory.

Many of the points advanced in this paper may seem obvious, but some are often overlooked, and so it seems worth while to gather them together for emphasis.

I have avoided the words "research" and "experiment" in the title, because whenever observations have to be made, for any purpose whatever, there are certain underlying principles which govern the making of them. We may classify the reasons for making observations, at least in dental work, under two main headings—diagnosis and research. Research itself may be further subdivided into survey work (which may frequently cover diagnosis as well) and experimentation. In all cases, observations have to be interpreted after they are made; in all cases, interpretation is hampered by the fact that many different factors produce variation in the observations. Good planning leads firstly to a knowledge of the sources of variation, secondly to methods of control of that variation which will increase the reliability of the final interpretation.

Observations may be of three kinds:—

(i) *Qualitative* or descriptive, where the character being observed can be put into one of a number of classes, but cannot actually be measured. Under most conditions colour is an observation of this type; death or survival of an experimental animal is another.

(ii) *Quantitative*, when an actual measurement or count can be made. The number of bacilli of a given type in the mouth, or the percentage of surfaces in a mouth affected by caries, are quantitative observations.

(iii) *Semi-quantitative*, when the character cannot be measured but is put into one of a series of graded classes, to each of which a score is given.

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Qualitative observations frequently turn into quantitative ones; though the characters themselves are not measurable, the counts in various classes are quantitative figures and they become the subject of final analysis. For example, if each of a group of 20 rats is injected with a toxin, the death or survival of each rat is a qualitative observation but, if 10 die, then the 50% death rate in the group becomes a quantitative one. Discussions on quantitative observations which follow can therefore frequently be made to apply to qualitative ones as well. Quantitative observations should be sought wherever possible, however, as qualitative ones are often subjective.

Before embarking on a series of observations, the worker should write out a plan of operations. The value of such a "pre-schedule," as it is frequently called, cannot be over-emphasised. It should be set out under the following headings:

Objective of observations.

Width of inference to be drawn.

Actual observations to be made and procedure to be followed.

Proposed analysis of results and method of presentation.

Such a setting out ensures that the observations will answer the questions asked in the quickest and most economical way. A clear statement of objectives is the starting-point; width of inference required will identify the field of enquiry (are conclusions to be confined, for example, to children at one school, or do we want a cross-section of the community); discussion of the actual observations to be made and their relationships will help not only in making sure the right ones are taken but in avoiding unnecessary ones; carrying right through to the proposed methods of analysis and presentation will again ensure that the right observations are being made, with due stress on the more important ones.

Objectives themselves will fall into one of two main classes: (i) determination of a mean value for one or more variables in a group, e.g., the percentage incidence of caries in a given population, or (ii) to examine the differences between such mean values for two or more groups, e.g., the percentage incidence of caries in two towns whose water supplies differ widely in fluorine content. Whichever type of objective is under consideration, variation would cause no trouble if every unit in a population could be observed. If we wanted to make a statement having an objective of the first type, such as the mean percentage of surfaces affected with caries in the mouths of natives in a certain New Guinea village, and the total population of the village were 50, then every individual could be examined and the mean percentage could be given with certainty for that village. But if the population were 50,000, then total examination would be impossible. A sample of, say, 100 would have to be taken as representing the whole. But the percentage varies from person to person and from one group of 100 to another, and we need some indication of the reliability of the mean of 100 as representing the whole.

Let us assume for the moment, for simplicity, that this variation in count is random and not due to any assignable cause such as age or sex—in other words, let us assume that any surface in any individual's mouth is equally likely to become infected. We need then only calculate figures called the "variance" (s^2) and its square root, the "standard deviation" (s), which measure the extent of the variation in percentage infected surfaces from person to person. Then the variation in means of groups of n persons drawn at random from the population could be predicted, the standard deviation of such group means, or "standard error of the mean," as it is called, being $\frac{s}{\sqrt{n}}$. We could then apply what are called "confidence limits" to the observed group mean. Suppose the mean percentage* infected surfaces for a group of 100 persons were 55, with a standard deviation of 20. The standard error of the mean would be $\frac{20}{\sqrt{100}} = 2$, and the 95% confidence limits for the mean would be $55 \pm (2 \times 2)$. By this we indicate that if we make the statement that the mean of the population of 50,000, which we are trying to estimate on a sample of 100, lies between 51 and 59, [(55 — 4) and (55 + 4)], we would only expect to make a wrong statement for 5% of the possible samples which we might draw.

This, then, is the simplest first step in planning—so to choose n that we achieve confidence limits which are satisfactorily narrow. To do it, we must have previous experience which will tell us what variance to expect, and we must make up our minds concerning the confidence limits we require.

We can carry this example further to cover an objective of the second type.

*In dealing with percentages of this nature, it is only in certain circumstances that they can be handled directly, as indicated here. In general, they must be transformed in some way first.

Suppose we wished to compare the mean percentage of surfaces infected for two native villages. If the population of one were 50 and the other 60, we might again do a complete examination of both and perhaps be satisfied that we had a real difference between them. But if these populations were 50,000 and 60,000 we would again have to sample each, and this time we would need to decide whether any difference observed between the two sample means, drawn from different villages, could have been found between two samples drawn at random from the same village. A different concept now arises—that of "statistical significance" of the observed difference. We set up what is called a "null hypothesis" and assume, to begin with, that we would find no difference in percentage of infected surfaces between the two villages if we could examine every individual in both. We then proceed to calculate how often we would expect to find differences as large as the observed one between two samples, if our assumption were correct. If the frequency with which we would expect the observed difference to occur is small, or, in statistical language, if the probability (P) of occurrence of such a difference is small, we discard our original hypothesis of no difference and accept the alternative one that the difference is "significant." "Small"—but how small? This is a matter for arbitrary decision—a commonly accepted value for P is 0.05, that is, if a difference as large as the observed would occur in only 5% of paired samples by chance, then we say the difference is "significant at the 5% level." Other more stringent values of P are 0.01 and 0.001.

The calculation of P involves the variance which we have previously discussed in connection with confidence limits. The bigger this random variance is, the larger the differences between samples which can arise purely by chance, and the harder it is to demonstrate that an observed difference is "significant."

Significance tests are of many kinds; we can test variability among sets of means, and also the significance of variability arising from different causes. But the ultimate test is always against what we have called "random" variation, to which no cause can be assigned. The smaller this variation can be kept, that is, the more we can reduce it by eliminating or controlling *assignable* variation, the smaller our confidence interval will become in objectives of the first type, and the easier it will be to demonstrate differences in objectives of the second type. Planning in effect could be called a study of variation and the methods controlling it.

Sources of Variation.

We will discuss sources of variation here under two main headings, random variation and assignable variation, while the next section will deal in detail with methods of control. Assignable variation will be further subdivided into:

(i) Technical sources of variation:
- (a) Instruments;
- (b) Observers;
- (c) Time changes, due to custom or fatigue.

(ii) Variation within an observational unit (e.g., a human being):
- (a) Location of observation on or within the unit;
- (b) Time of day or season of year;
- (c) State of health, diet, etc.

(iii) Variation from unit to unit or group to group (general):
- (a) Race (or breed);
- (b) Age;
- (c) Sex;
- (d) Economic status;
- (e) Occupation;
- (f) Geographic location.

(iv) Variation affecting groups of units (particular):
- (a) Ward in hospital, where a patient is located, school which a child attends;
- (b) Pen or cage in which an animal is located.

Random Variation.

Random variation is strictly variation due entirely to chance, though frequently when we are planning experiments we are forced to lump all unassignable variation under the one heading. Fortunately for us, truly random variation is frequently governed by one of a number of known laws, knowledge of which enables us to determine what variation to cater for. One of the most common types of random variation is that occurring when observations are said to be "normally distributed." If we have 1,000 humans of the same age, sex and race who have lived on approximately the same diet, then their heights follow a given pattern—there will be a maximum number with heights between, say, 66 and 68 inches, a slightly smaller number with heights between 68 and 70 and about the same number on the other side, between 64 and 66; the numbers between 62 and 64, and 70 and 72 will also be similar but slightly less again, and so on.

A vast body of statistical theory, including confidence limits and most tests of significance, is based on an assumption that the observations are "normally" distributed. Fortunately a slight departure from normality does not affect the results seriously, but when handling new material the experimenter should explore the kind of variation with which he is dealing, so that he can apply statistical techniques properly. Data can often be transformed from their original scales into new ones, such as logarithms, to help in the application of standard techniques.

Two other types of variation which might be met in dentistry are the binomial and Poisson distributions. The binomial distribution governs qualitative observations which can be classified in one of two mutually exclusive ways—head or tail of a penny; death or life in an experimental animal; boy or girl in a newly-born baby. We know that if we tossed an unbiassed penny thousands of times we would expect half heads and half tails—but if we toss it ten times only, we do not always get five heads and five tails. Quite frequently the count will be six heads or four heads, less frequently, seven heads or three heads, and so on. One way of appreciating the meaning of a "level of significance" is to imagine that you are tossing a penny against an opponent. If he has a run of five heads, you won't think of much except your bad luck, but if the number mounts to six, seven, eight, nine, ten—well, you begin to suspect that he knows how to toss. At what stage do you begin to suspect that something other than chance, namely, his skill, is operating? That depends on you, perhaps on your length of experience—but if your experience extends to knowing that penny-tossing follows the binomial distribution, you can calculate just how often you would expect a penny to fall heads ten times out of ten, nine times out of ten, and so on, even if only chance is operating. And you can decide for yourself at what probability you are going to become suspicious—which is your "level of significance."

Research workers frequently have to work with groups of animals, where the classification is into life and death, affected and not affected with disease, and so on. If the mean disease incidence in rats is 50% we do not expect every group of 2n rats exposed to infection to have n infected, but if we expose a number of groups, we can predict how many we would expect with (n — 1) infected, (n + 1) infected, and so on. In this way we can guard against the formerly common error of using so few animals in each of two treatment groups that no significant difference in disease incidence could possibly be demonstrated between them. For example, if the average incidence of nutritional deficiency diseases in rats on a certain diet were 50%, and only four rats were put on this diet and four on a contrasting, more favourable one, no difference could possibly be demonstrated, because with a 50% incidence a group of four rats with none infected at all could be expected as often as once in sixteen such groups purely by chance, so that even a 100% success on the contrasting diet could not be regarded as significant.

The Poisson distribution occurs with data such as the count of particles in samples from a thoroughly mixed suspension, where only chance variation is operating. Blood and bacterial counts form good examples—cell counts on a haemocytometer slide are a classic one. It should be remembered that the Poisson distribution is followed when *only* chance is operating. Samples of blood from the same suspension would be expected to follow it, but samples from the same individual at a different time might be affected by variation from other sources. One feature of the Poisson distribution which should be stressed is the high variation which should be expected. The variance is equal to the mean, so that the higher the mean count, the greater the variation about it. The practice of discarding an outlying cell count or bacterial slide count without any test of homogeneity is wrong.

Knowledge of the binomial and Poisson distributions leads to valuable checks on the accuracy and consistency of techniques, which can be planned for.

Assignable Variation.

(i) *Technical sources.*

(a) *Instruments.* Instruments can introduce random variation and/or bias. They should, of course, be checked for both and frequently standardised. Even then, when more than one instrument of a certain type has to be used in an investigation and the results from different instruments have to be compared, planning should ensure that an important comparison does not include an instrument difference as well. If, for example, body weights of two groups of experimental animals which have been on different diets are being taken, and for some reason two weighing scales have to be used, then it would be preferable to weigh half of each group on each scale rather than all of one group on one and all the second group on the other. Classical plans for this type of control are discussed briefly later.

(b) *Observers.* A classical way of demonstrating that all observers do not see alike is

to draw a straight line on a card, and to pass it round a class of students, together with a measuring scale marked in, say, tenths of an inch. The line should be of such a length that when one end lies on a marked division the other lies between two of them. Each student is then asked to measure the line, independently of all other students. The result, with a large class, will be a normal distribution of values. If the line is actually 6.4 inches long there will be a large number who will give 6.3, 6.4 or 6.5, a lesser number giving 6.2 and 6.6, and so on. Research workers are accustomed to the idea of observer differences with subjective observations, but it is sometimes hard to convince them that differences can also arise even with the simplest of measurements. When more than one observer has to be included in a series, all observers should be checked against each other by measuring the same material, both at the start and, for a long investigation, at intervals through it. With subjective observations, two independent assessments are preferable though often not practicable. In addition to these precautions, it is sometimes possible also to regard observers as an assignable source of variation and to control observer-differences in the experimental plan.

(c) *Time changes.* Time changes in observations can be brought about either by fatigue or increased skill from practice, generally on the part of the observer but occasionally on the part of his subject, if the latter is human or animal and given frequent re-examination. Time changes can be controlled in the same way as instrument differences; the chief point is to be on guard against them.

(ii) *Variation within an observational unit.*

(a) *Location of observation.* This is a very obvious source of variation, yet it is sometimes ignored. The observer should find out whether location differences exist before ignoring them. In my own particular field of sheep and wool research, where a series of measurements is made on wool samples taken from the living animal, we have devoted some time to determining the part of the sheep's back from which the samples should be taken, because such characters as the diameter of the fibre and the number of fibres per unit area vary markedly over the body. If just "a sample of wool" were taken, the variation introduced from animal to animal by location differences would greatly increase the number of sheep which would have to be used and the number of observations which would have to be made to show up differences between groups of animals.

In much dental work the observational unit is likely to be an individual or an animal, or a part of an individual or animal, and similar location differences could be looked for.

(b) *Time of day or season of the year.* These are both likely to have a marked effect on many biological observations. The number of bacilli in the mouth, for example, is likely to be related to the length of time since rinsing or tooth-brushing.

(c) *State of health, diet, etc.* Under this heading come the many things which are likely to cause variation in the same observational unit at different times.

(iii) *Variation from unit to unit or group to group (general).*

The sub-headings given earlier under this title are all obvious ones, being applied mainly to humans, though some would apply to experimental animals as well. They are not likely to be overlooked as a potential source of variation; their main importance probably arises in connection with determination of the width of inference to be drawn. Confining of observations to one sub-section or another under these headings will limit the inference as well. In experimental comparisons, the classic plans for controlling variation which are discussed in the next section can also be used for widening the inference by including a wider range of material for observation, while in survey work the groupings under this heading are of major importance.

(iv) *Variation affecting groups of units (particular).*

A local, temporary environment such as a hospital ward, school, or animal cage can have an influence on units within it which is not always so obvious and has very frequently been overlooked. Giving of one drug to one hospital ward and another to a second ward does not always give a valid conclusion concerning the relative efficiency of the two drugs in disease control, because there can be quite incalculable but different factors in the care of the patients in the two wards. Similarly, one cage of animals might be nearer a light, or nearer a window for sunshine, and receive unpremeditated benefits which might be ascribed to different treatments. In such cases, it is safer to regard the whole group as a unit, rather than each individual within it, or to regard part of the group as a unit and include more than one treatment in the group. Either plan means replication of the groups, as the individuals receiving the same treatment within one group may not count as independent replications.

CONTROL OF VARIATION.

All we can hope to do in a short time is to indicate some of the lines of approach for controlling variation. "Control" does not imply altering any particular observation to make it fall into line, but so planning the work that outside sources of variation do not interfere with the ones on which we are seeking information.

We can subdivide the lines of approach into two main fields corresponding to the two types of objective which were defined earlier: (i) seeking a mean value for an observation, with specified limits of accuracy, and (ii) comparing two mean values. Each field subdivides again into survey work, which records observations under existing conditions, and experimental work, which sets up conditions first and observes what happens under them.

For survey work, definition of width of inference is most important. Within the population selected for study all possible sources of variation must be listed, and the population divided into sub-classes according to them. Planning then lies in ensuring that all sub-classes are adequately represented. This type of planning has received considerable attention in recent years, and U.N.E.S.C.O. set up a special sub-committee to draw up recommendations for techniques to be adopted throughout the world in such things as sample agricultural censuses, which can be carried out for a fraction of the time and cost of the full censuses which are still the custom in many countries. A book entitled "Sampling for Censuses and Surveys" was published last year by F. Yates[1] of Rothamstead, who is one of the members of this sub-committee.

This book will give an idea of some of the ways in which surveys may be tackled. It deals mainly with large-scale work, but the principles involved in ensuring sub-class representation and obtaining an estimate of the confidence limits of the mean can be applied on a smaller scale. In our previous discussion of confidence limits for percentage surfaces affected by caries, we assumed only one source of variation (random), and assumed that such things as age and sex had no influence on our observations. This is not true, and in practice care would be taken to sample the village population over age and sex classes, the sub-class differences being taken into account in assessing the confidence limits of the mean. Estimation of the variation from different sources is part of the story in survey work, and information concerning it is of equal importance with information about the mean.

In experimental work the emphasis is slightly different; we must have information about variation from different sources, but we are more concerned in allotting it to its cause and balancing it in such a way that the sources we are comparing are free from outside influences. Let us take the simplest form of control as an example. This is the "randomised block" developed for agricultural field experiments*. Soil varies from place to place in a field, and if varieties of wheat are to be compared for yield, a plot of one variety may do better than another simply because of differences in the soil. A block of plots is therefore chosen which are as uniform as possible, the number being equal to the number of varieties under test. The varieties are then allotted at random to the plots, so that nothing but chance is operating in deciding which variety goes to which plot. It is impossible to make all the plots absolutely identical; we can only hope to reduce variation to a minimum by getting them as uniform as possible. Some varieties may still be favoured by soil differences. To overcome this, we "replicate," that is, add further similar blocks, so that each variety is growing on a number of small plots, scattered over different blocks. The blocks may be very different, so long as the plots within each block are as uniform as possible. Variation due to block differences can be disregarded when we are seeking an estimate of random variation against which to compare the differences between our varieties.

In this simple design three principles of planning are involved: first, the principle of *random* allotment within a block, to make sure that only chance operates in the way any variety is affected by unassignable variation; secondly, the principle of *replication*, to control random variation by the reduction of the confidence limits of the mean yield of each variety; thirdly, the principle of controlling assignable variation by balance—each variety is represented in each block, so that although block differences in yield may be large they can be disregarded.

Randomised block experiments were first developed for agricultural experiments. They are applicable, however, in very many types of research. In the agricultural experiments, differences in soil fertility constitute the assignable cause of variation which is being controlled. Some of the assignable causes which we have been discussing could be controlled the same way—the example of weighing half of each of two groups of animals on different diets on each of two scales constitutes, in effect, a "randomised block,"

*For detailed discussions of experimental plans, see Fisher[2] and Cochran and Cox[3].

"block" differences this time being differences between the two scales. Time changes can very effectively be controlled by use of this technique. Suppose the number of bacilli in the mouths of persons on different diets are being compared, there being, say, 10 persons on each of four diets. After culture the observer might have a large run of slides to examine, and fatigue might well mean that the counts tend to become lower with time. It would be a mistake to examine all the slides from one group first, then all the next, and so on—they should be taken in blocks, each block containing the same number of slides from each treatment, and the order of the treatments within each block should be random. Then, not only can mean values be compared free from any time effect, but this time effect can itself be assessed and the variation due to it removed from the estimate of random variation on which the demonstration of significant differences depends. Set lengths of time, each containing the same number of slides from each treatment group, constitute the "blocks" on this occasion.

The essential of a randomised block design is that units within each block to which treatment is to be applied shall be as uniform as possible for the variation being controlled, though there may be large differences from block to block. Also, the number of units shall equal the number of treatments. Two developments from the design are worth mentioning. Firstly, since large differences between blocks do not affect the random variation with which treatment differences are compared, the blocks can be made intentionally different and the basis of inference for the whole experiment thus widened. In assessing the effect of diet on caries incidence, for example, children of one age group could constitute a block and different blocks could be of different ages, and conclusions would then be of wider application than if the experiment were confined to one age group. Secondly, the necessity for having as many units within a block as there are treatments cannot always be met, either because the number of treatments is very large or because the number of units is limited. The former case arises frequently in agriculture if new territories are opened up to cultivation and large numbers of varieties of crops need to be tested; it could arise in dental research if comparison of a large number of drugs were required. The second case might arise in a case where genetic variation is to be controlled, and identical twins or litter mates might constitute the "blocks." Much research has been done into balanced designs to meet these cases; details are given by Fisher[2] and by Cochran and Cox[3].

Designs for controlling variation from more than one source are also available, and are discussed in these two books.

The techniques involved so far, in this discussion, we have described as "balancing" sources of variation. These are factorial designs and additional observations. Factorial designs constitute another plan for widening the basis of inference without unduly increasing the number of observations, and additional observations can be a further aid not only to controlling variation, but sometimes to decreasing the cost of experimentation.

The principle of factorial design is to try out a number of treatments together, instead of a few at a time. Suppose that we are examining the durability of tooth fillings and that these are affected by a number of factors —say, for example, the proportions in which the ingredients are mixed (the "mix"), the temperature at which these are mixed in the room ("room temperature") and the length of time for which the mixture stands before insertion ("time interval"). This is probably not an exhaustive list, but it will serve for illustration. In a type of experiment frequently set up, one factor at a time will be varied—perhaps the mix will be varied at a constant room temperature and time interval. If a comprehensive statement as to the effect of mix is to be made, information must be available as to its effect at *all* room temperatures and time intervals. If the factors are varied, one at a time in a series of experiments, each experiment must contain sufficient replication to give an answer by itself. If the factors are all varied in a single experiment, what is called "internal replication" is provided, and the conclusions are obtained on a wider basis with less work. In a factorial experiment to test the fillings, we might decide to try three "mixes" (these are sometimes spoken of as three "levels" of the factor), three room temperatures and three time intervals. There are altogether 27 different combinations, giving 27 "treatments." There are many different ways of handling these in their actual allotment to units; the most comprehensive discussion of the subject is a monograph by Yates[4], and the subject is also discussed by Fisher[2] and by Cochran and Cox[3]. It is easy to see that even if each treatment combination is applied to only one unit, the comparison of the three "mixes" is on means of 9 units, and so on. Information is available not only on what are called the "main effects" of each of the three factors, over all combinations of the other two, but on "interactions"

between them—is the superiority of one mix over another at one room temperature the same irrespective of the time interval, or does a lengthened time interval increase the difference?

Additional observations which are not under discussion but are closely correlated with those which are can sometimes be of great help in increasing the precision of an experiment. Pre-experimental observations which can forecast experimental variation are an example. If a uniform crop is grown on an area of land before that area is sown with different varieties, the potentialities of the plots are known, and by adjusting for initial plot differences another assignable cause of variation has been accounted for. Sometimes the observation on which information is sought is difficult or expensive to make, but another, closely correlated with it, is much simpler.

Bias.

A discussion of planning would be out of place without a brief reference to bias. It has been discussed already, but emphasis should be placed on the need for guarding against it. One common source of bias lies in the observer's selection of his material, and here adherence to the rules of randomisation will assist—but "randomisation" must be strictly defined. Suppose the size of cells on a slide is being measured, and a random sample is to be taken. The sample is *not* random if the observer merely takes ten on each of a number of fields, and says "I'll have this—and this—." His eye is liable to be caught by the larger cells and bias will result.

An observation can have a very high order of precision in that it is repeated within a very small margin, and still be biassed. An example would be a set of scales which gave readings within very small limits for repeated weighings of an object, but was consistently under-weighing by half a pound.

Conclusion.

These notes are intended to guide observers when planning their observations. For the research worker, I hope it has been made clear that knowledge of sources and control of variation can help; for the clinician, it should be equally clear that he must know the mean and variability of a "normal observation" before he can class one as "abnormal"; he must also know what factors influence this mean and its variability. A volume of literature on experimental designs over a wide variety of fields has been built up during the last twenty-five years, and is worth consulting before any task is begun.

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Some Useful Gold Inlay Cavity Preparations for the Anterior Teeth*

William M. Jones, B.D.S. (Syd.).

It is not possible to describe all the manifold restorations which have been suggested for the above group of teeth during the last forty years. Instead, the more commonly occurring cavities have been chosen and certain inlay designs suggested for each which will give good results for the general practitioner. Some will be conventional types, whilst a few are somewhat new.

Our objective, then, is to examine cavities of Classes I, III, IV and V, according to the Black Classification. Briefly:

Class I cavities are those beginning in structural defects in pits and fissures.

Class III cavities are those in which caries occurs in the mesial or distal surfaces of the tooth, but has not extended far enough towards the incisal angle to weaken it and thus indicate its removal.

Class IV cavities are those in which caries occurs in the mesial or distal surfaces of the tooth but, in addition, has so weakened the incisal angle that it has already collapsed or, if present, must be removed.

*Read at the 12th Australian Dental Congress, Sydney, August, 1950.

Class V cavities are those occurring in the gingival third of the labial and lingual surfaces of the teeth.

The various steps in the performance of each cavity preparation, together with details of the instrumentation to be employed, lie beyond the scope of this paper. Excellent diagrams of all phases of operative technique are to be found in textbooks on the subject. Attention will therefore be devoted only to the finished cavities. Where pulp involvement has rendered devitalisation necessary, a post inlay will yield the best retention of all. As these are easy to construct and well known to all, they shall be excluded from this discussion.

The majority of dentists readily admit that most inlay failures in vital anterior teeth can be ascribed to (a) insufficient retention, (b) pulp disturbances of varying magnitude. As a general rule it is impossible to have too much retention. However, in our efforts to obtain adequate retention form, we must be careful not to encroach too closely upon the pulp if we are to avoid those unpleasant sequelae, due to pulp irritation and death, which may occur months afterwards. In this regard, it is essential that we have a clear conception of the shape and position of the coronal portion of the pulp, and take adequate steps to protect it from both mechanical and thermal injury during the preparation of the cavity.

Class V Cavities.

Although the conventional box-shaped cavity will give splendid results, there are times when additional retention is necessary. One easy, safe way to do this is to place two small tapered pin-holes in the bottom of the cavity, one on each side of the pulp. Burs Nos. 700 and 701 are ideal for the purpose. The same procedure may be adopted with all the upper and lower anterior teeth.

Class III Cavities.

(a) *Labial approach.* This is often possible. With the uppers, it is indicated in those cases where the bite is favourable, that is, edge to edge or protruded. Although academically unsound in some respects, this is a very practical type of cavity which will yield good results if attention is devoted to the correct shaping and inclining of the two plane walls which lock the inlay into position. This type of cavity is indicated for all the lower anteriors, even when the cavity involves portion of the lingual surface as well.

The labial outline form can be modified at will by a good broad bevel.

(b) *Lingual approach.* In most cases, particularly where the bite is normal, the lingually inserted inlay is indicated for the upper anteriors. Provided the caries has not advanced too far, the dovetailed cavity will give good results. The preparations for the upper central and lateral are very similar, while that for the canine is modified slightly in accordance with the anatomy of the tooth. In nearly all of these cavities an extensive bevel towards the incisal aspect of the tooth is necessary to provide the required extension for prevention. In many upper canines, this type of cavity will resolve itself technically into a Class IV, but the retention of the dovetailed form is usually adequate.

If the caries is somewhat extensive, the small lingual step may be necessary. Great care should be taken not to make this too deep; in most cases it must not be deeper than the dentino-enamel junction, particularly if the tooth has a deep lingual fossa. The step portion should be cut as close to the cingulum as possible. It is common to find caries in the lingual pit as well; this results in an easier cavity preparation, because less sound tooth structure will have to be removed.

On account of the direction of the major forces of occlusal stress, lingually inserted inlays of any kind are not usually employed with the lower anteriors.

Many operators, in their unwillingness to remove an incisal corner, persevere with a Class III design which ultimately breaks down under biting stress. If there is any doubt that an incisal corner will not stand up to the forces of mastication, it should be removed at the outset, and a Class IV cavity designed for the case.

When finishing the enamel margins of all Class IV cavities, it is a good plan to round off the labio-incisal corners with great care, using fine sandpaper discs, in order to avoid the possibility of an annoying enamel fracture in the future.

All the cavity designs for the upper central may be applied to the upper lateral. However, it must be admitted that more pulp troubles are encountered with the upper lateral than with any other anterior tooth. This may be due to the fact that the pulp chamber of the upper lateral is proportionately larger than that of the central.

Class IV Cavities.

These can be conveniently subdivided into:

(a) Unilateral, where one side of the tooth only is decayed, and

(b) Bilateral, where both mesial and distal surfaces are involved.

In general, bilateral cases are best treated by uniting the cavities and making one inlay of the three-quarter veneer type, rather than two separate inlays.

(a) *Unilateral Class IV cavities.* Several step forms are available. The conventional lingual step or lingual lock is useful in upper centrals and laterals where the tooth is thick labio-lingually or the lingual fossa is not very deep. Delayed pulp disturbances will nearly always follow its use on an upper lateral with a deep lingual fossa. The lingual step design is not of much value in upper canines as the whole of the step portion will usually have to be prepared in non-carious, thick, hard enamel. In any event, the step should always be placed as close to the cingulum as practicable, on account of the greater bulk of enamel and dentine in this area. The best shape for the step would seem to be fairly large, yet shallow, with boundaries inclined at suitable angles to avoid interstitial displacement.

This cavity design is never used on the lower teeth.

Incisal step. Results are sometimes disappointing with upper centrals and laterals, but quite good with upper canines and all the lower anteriors. In most cases two tapered pin-holes can be placed, one in the gingival floor and the other in the floor of the incisal step portion, as close as possible to the other proximal surface.

Where the lower centrals and laterals are concerned, it is a good plan to remove the incisal tip throughout its entire length, in order to give protection to the enamel margin. With lower canines this step is not necessary, because of the angular shape of the incisal edge. Where there is evidence of marked attrition, the box form along the incisal edge can be made quite substantial, as considerable recession of the pulp will probably have occurred.

Modified three-quarter veneer type. This is unquestionably one of the most useful designs for a unilateral Class IV cavity, both from a point of view of excellence of retention as well as freedom from pulp worries. It can be modified to suit every one of the upper and lower anterior teeth.

Most of the retention is obtained from the groove on the carious proximal surface, the veneering of the whole of the lingual surface, and the placement of two tapered pin-holes, one in the proximal portion of the dentine opposite the carious lesion and the other into the cingulum area. The latter can often be made quite deep, without loss of comfort to the patient. This will aid in establishing a "three-point" retention, which is usually superior to the "two-point" variety yielded by conventional lingual lock designs. The enamel margins along the incisal edge will have to be given special protection, with the result that a small line of gold will show in this area. This will always be preferable to having enamel fractures in the future. The lingual veneer should be very thin—never deeper than the dentino-enamel junction, on account of the very thin layer of dentine available, as pulp protection, in this area.

Although the lower teeth have not the well developed cingula found in their maxillary counterparts, in each case it is possible to place a fine tapered pin-hole in the linguo-gingival margin of the cavity. This will result in superlative retention. Whether a sliced or shoulder finish is employed for the gingival margin will depend upon the tooth, the extent of the caries, and the skill or preference of the operator.

(b) *Bilateral Class IV cavities.* Many cases will occur in which the tooth has a Class III cavity on one side and a Class IV cavity on the other. The writer believes that in all such cases the best practice is to remove the other incisal corner and make some form of three-quarter veneer inlay, inserted nearly parallel to the long axis of the tooth.

Here we must differentiate between the delicate, aesthetically designed three-quarter veneer crowns made upon non-carious teeth as abutments for fixed bridgework, and the much more solid, yet quite useful, three-quarter veneer inlays which are constructed for carious cavities. Often these have to be made over deep areas which have been "blocked out" by cement bases. Additional retention will nearly always have to be obtained in these cases by drilling a small tapered pin-hole, or even a small depression, into the gingival floor as well.

This form of restoration can be adapted to suit every one of the upper and lower anterior teeth. Where deep caries renders the placement of a cement base necessary, it is sometimes easier to take the wax pattern before putting in any cement, and grind away sufficient gold where necessary prior to cementation.

In regard to the lower anteriors, the very fact that carious cavities are present means that the patient's teeth are, in general, not sound, and probably support a number of restorations elsewhere. Hence, great care must be devoted to the provision of adequate extension to "immune" areas for the prevention of recurrent caries. This is particularly

important in those cases where there is overlapping of the teeth due to crowding.

Where caries occurs on both mesial and distal surfaces, and where one incisal corner has broken, or been weakened by caries or an old silicate filling, or if the lingual wall is markedly involved, it will be best to disc off both incisal corners and make a three-quarter veneer inlay.

Whether a sliced or shoulder finish is employed will depend upon a number of factors, but the general practitioner will obtain greater success by finishing to a shoulder, wherever possible. Although this means that a little more sound tooth structure has to be sacrificed, it will be found easier to construct an inlay with a definite edge, particularly when the direct method of making the pattern is the one to be employed.

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Root Canal Therapy and Immediate Periapical Surgery*

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The object of the technique to be presented is the solution of a problem which has long had a high nuisance value in conservative dentistry.

The treatment of chronically infected pulps of long duration has necessitated many visits by the patient for changes of dressings, etc., and the ultimate results of treatment have been far from satisfactory, particularly when there has been extensive periapical bone involvement. The result has been that both dentists and patients have in many instances concluded that such long treatments are not worthwhile; thus teeth which could have been restored have been lost and prosthetic appliances resorted to where they could have been avoided.

The operation known as apicoectomy was introduced many years ago with the object of assisting normal root therapy, but the proportion of successful results was not very high and for a period it fell into disuse. Under modern surgical conditions it has been revived and with the combination of correct technique and sensible case selection a very high percentage of successful results can be achieved.

Apart from the successful end results, the great advantage of surgery immediately following root therapy is the saving of time and frequent visits. Under good conditions the technique can be carried out in about one hour and a quarter plus two post-operative visits of about five minutes each.

Further, very strong antiseptics may be used in the canal with impunity because any periapical tissues which may be damaged by the drugs are removed by the subsequent periapical surgery.

*Presented at the 12th Australian Dental Congress, Sydney, August, 1950

The technique may best be described under two headings:

1. Root Canal Therapy and Filling.

The usual combination of broaches, reamers, files, etc., is used plus a metal hypodermic syringe kept specially for the purpose. This syringe is used for the introduction to the canal of all the drugs used, in order to achieve an irrigating effect as well as flooding the canal with the solution.

Reaming and filing is done with the canal filled with antiseptic, ensuring that the solution reaches all areas and so effecting sterilization in combination with mechanical cleansing.

There are, of course, many drugs which may be used but the following sequence has been found to produce the required results:

(a) Following wide opening for access and mechanical cleaning of the pulp chamber the canal is flooded with tricresol and formalin (formocresol), the needle of the syringe being carried as far up the canal as possible.

(b) Reaming and filing is carried on for about ten minutes with further introduction of formocresol as required.

(c) The canal is rough-dried with sterile paper points and flooded with a saturated solution of MONACRIN*.

(d) The canal is filed for a further period of about ten minutes in a flood of MONACRIN.

(e) It is again rough-dried and forcefully irrigated with hydrogen peroxide to dislodge and remove debris.

(f) Irrigation with saline is then carried out.

(g) Paper points are again used for drying.

*Product of Bayer Pharma Pty. Ltd.

(h) Thorough final irrigation is done with absolute alcohol and the canal thoroughly dried with paper points.

The root canal filling is then inserted immediately. For filling the canal euca percha, prepared by softening gutta percha in eucalyptol until a "clotted cream" consistency is obtained, has been found most satisfactory. This paste is freely introduced into the canal and gutta percha points of suitable size plugged forcibly into it until the canal is overfilled.

Strongly antiseptic root canal fillings are contra-indicated as they may cause irritation and prevent bone regeneration.

2. Periapical Surgery.

Immediately the root therapy and filling has been completed an X-ray is taken to check the completeness of root filling, and while it is being processed local anaesthesia is established.

The term periapical surgery is preferred to apicoectomy because it is considered that the actual resection of the apex is incidental to the main part of the operation. The chief object is to curette the tissue surrounding the apex so that only healthy bone remains. The resection of the apex aids in thorough removal of infected tissue and also eliminates a section of the root which may not be completely filled because of minor subsidiary canals which frequently exist.

The orthodox semi-lunar incision is made in such a way that the small muco-periosteal flap can be reflected above the apex to gain access to the periapical tissues.

Opening through the bone is done with chisels and bone reamers. Hand pressure, or light malleting with a mechanical surgical mallet, is less unpleasant to the patient than severe hand malleting and usually hard blows are unnecessary. Even the actual apicoectomy does not require a heavy blow if the correct chisel is used.

Following thorough curettage the cavity is washed with normal saline and a mixture of equal parts of sulphanilamide and sulphathiazole introduced generously. Introduction of ground sterile bone dust or artificial bone dust has been tried and quick bone regeneration noted, but such adjuncts are not absolutely necessary.

Catgut sutures are used to coapt the flap and post-operative treatment is limited to irrigations. Sutures are removed on the fifth or sixth day.

A high proportion of success, as evidenced by clinical and radiographic means, may be anticipated provided cases are carefully selected and the treatment carried through with meticulous care, but it is wise not to institute extensive restorative measures until and unless a check X-ray not less than three months after operation shows signs of bone regeneration. Actually regeneration is rarely complete under six months.

Mention of case selection leads to some thought in regard to indications for the use of this form of treatment. Broadly, the following rules should be observed:

(1) Confine the operation to the anterior teeth.

(2) Confine it to healthy patients in the regenerative period of life—generally not beyond the age of forty-five.

(3) Never attempt it in the acute stages of infection. Reduce the infection to the chronic stage by drainage and the use of antibiotics.

(4) Avoid it in the presence of advanced periodontal destruction.

(5) If it exists, correct severe malocclusion on the tooth to be treated.

(6) If the tooth is to be used as an abutment, treat only if there is particularly good bone support.

Since this method was introduced into my practice some hundreds of treatments have been performed. No detailed statistics have been kept but failures have been so rare as to occasion comment and in most instances have been borderline cases where treatment has been instituted in an attempt to avoid prosthetic appliances. In such cases the chances have been clearly placed before the patient before operation. The following cases illustrate what can be achieved (Figs. 1-4).

It must be emphasized that slipshod technique will result only in disappointment to both patient and operator and will bring a useful technique into disrepute.

217 Macquarie Street, Sydney.

(a)

(b)

Fig. 1.

(a) Pre-operative;

(b) Root filling and apicoectomy 15-3-51.

(c) Post-operative, showing bone regeneration 14-6-51.

(c)

(a)

(b)

Fig. 2.

(a) Pre-operative;

(b) Root therapy and apicoectomy 12-9-49;

(c) Post-operative 17-5-50.

(c)

(a)

(b)

Fig. 3.

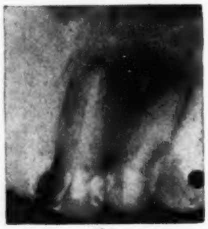
(a) Pre-operative, previous root filling;

(b) Root therapy and apicoectomy 30-11-49;

(c) Post-operative 11-5-50.

(c)

(a)



(b)

Fig. 4.

(a) Pre-operative;

(b) Root therapy and apicoectomy 18-10-50;

(c) Post-operative 4-5-51.

(c)

Mucins and Mucoids in Relation to Dental Problems*

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Mucins and mucoids have to be considered in relation to dental problems because the saliva is relatively rich in these substances. The source, variation in concentration and the functions of the salivary mucoids, especially their role in plaques, the mucelytic enzymes and also the mucoids of teeth will be considered.

Saliva and the Salivary Gland.

Saliva is a mixed secretion from the salivary glands which may be divided according to size into the large and small glands. There are three pairs of large glands: the submaxillary, sublingual and parotid, and the small glands are divided into the labial, buccal, palatal and lingual[1]. The glands are also classified as serous, mucous or mixed according to the types of alveolar epithelium present[2].

In serous glands the alveoli are lined with serous cells which secrete mostly water and some inorganic and organic compounds and protein. Cells of the mucous glands produce a secretion which, in addition to the salts and water, contains mucoid. In man purely mucous glands are not numerous, being found chiefly among the small glands on the inferior surface and margin of the tongue. The secretion from the parotid is almost entirely serous being clear and watery and contains the enzyme ptyalin. The chemical and physical properties of the secretion from the submaxillary glands are believed to be similar to those of the secretion from the sublingual glands, the secretions being collectively called mandibular saliva. The mixed secretion from the two sets of glands is viscous and opalescent, these glands containing both serous and mucous alveoli.

The composition of saliva will vary according to the rate of secretion of the different glands. The unstimulated rate of flow from the mandibular glands is about equal to that from the parotid gland, but on paraffin stimulation the rate of flow is increased, by far the greater increase being in that from the parotid secretion[3]. Accordingly the saliva becomes more watery. The parotid gland is also stimulated by sour liquids such as lemon juice and the sublingual gland by bland substances such as bread and milk[1] and even water[2]. Owing to the variation in flow from the different glands, depending on the stimulus, the mucoid content of saliva will accordingly vary.

Definition of Mucoid.

The viscosity of saliva is due to the presence of mucins or mucoids. These two terms have been used interchangeably in the literature. Meyer[4], however, prefers to draw a distinction between the two words; "mucin" has only a physiological meaning denoting a viscous solution whereas "mucoid" denotes a substance which contains a mucopolysaccharide in firm chemical union with a peptide. The mucopolysaccharide moiety is composed of hexoses, amino sugars or hexosamines, and sometimes uronic acids, the hexosamines usually being acetylated at the amino group. The mucoids differ from glycoproteins in the amount of hexosamine present, mucoids being defined as substances containing more than 4% hexosamine and the glycoproteins less than 4%. Following Meyer's definition the term "mucoid" will be used when the chemical compound is being referred to.

Mucoid Content of Saliva.

Only small amounts of mucoid are required to produce a viscous solution. Synovial fluid, for instance, contains only .02% to .05% hyaluronic acid but owes 80%-90% of its viscosity to this component[5]. Various workers have determined the mucoid content of activated saliva. Inouye[6] found 0.08% to 0.60%, Glass[7] 0.05% to 0.30% and Dobbs[8] 0.10% to 0.37%. Gorlin[9] determined the protein content, most of which would be mucoid, and obtained highly variable results, the mean value being 0.28%. All these results were obtained with paraffin-activated saliva; resting saliva will have a much higher mucoid content. One difficulty in estimating the mucoid content is that it is being continually broken down by enzymes and so a quick, accurate method is required.

Burnet[10] has developed a quick method in which the mucoid-containing solution is coloured with congo red and allowed to drop

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†Working with the aid of a grant from the National Health & Medical Research Council, at the Institute of Dental Research, Chalmers St., Sydney.

into an acid-alcohol mixture. According to the concentration, a compact globule or a ring of precipitated mucoid is obtained and when no mucoid is present only a diffuse haze is formed. By making serial twofold dilutions in saline, a measure of the mucoid content is obtained by finding the greatest dilution which gives a ring. This method, called the ACRA method (from the first letters of Acid Congo Red Alcohol), is specific for mucoids and mucopolysaccharides but is not very accurate. Other methods which have been developed, such as acid precipitation[6] and absorption of iodine[7], do not appear to be specific for the mucoid molecule and no completely satisfactory method is available.

At the Institute of Dental Research, the mucoid content of resting saliva has been estimated hourly between 7 a.m. and 8 p.m. for two successive days, using the ACRA method. The values for the one person were found to vary over a wide range and the results showed no regularity although no food or drink was taken between meals and the corresponding meals each day were substantially the same.

Thus, before any relationship can be determined between the mucoid content of the saliva and any other circumstance, it will be necessary first to determine under what conditions a sample must be collected in order to obtain a constant or representative value. The problem is further complicated by the fact that the viscosity of saliva is controlled by conditions other than those in the mouth. In pellagra[11], for instance, the saliva is ropy and has a high mucoid content.

Functions.

Several functions for the mucoids have been suggested. One of the functions of saliva is its lubricating and washing action in the mouth and one of the roles of the mucoids is to provide the oral tissues with a slippery surface, thus aiding the functioning of saliva itself. Also the movements of the cheeks, lips and tongue are facilitated, enabling food particles to move easily over the surfaces with which they are in contact and helping to prevent their lodgment on these surfaces[12].

The evaporation of water from viscous fluids is comparatively slow and the mucoids may assist in the prevention of desiccation of the oral membranes and dental surfaces[6]. However, if extreme conditions are imposed, for example, continual breathing through the mouth or during hard physical exercise, the saliva may become so viscous that its lubricating and protective properties are lost and thick ropy strands adhere to the teeth and membranes.

Another passive role has been suggested by Willsmore[12]. The mucoids may help to decrease the liability to salivary calculus formation, as in viscous saliva the cellular debris will be kept in suspension more readily.

Mucoids have a marked inhibitory effect on the action of some proteolytic enzymes[5] and salivary mucoids may decrease the proteolytic activity of organisms in the saliva.

The possibility that the salivary mucoids have a buffering action suggests itself but there is no evidence either for or against this idea. However, it appears[13] that phosphates are mainly responsible for the buffer action of saliva. In the plaque (which will be discussed in detail later) the buffering capacity is considered to be due principally to the protein content[14, 15] which is mainly mucoid. Thus, in the saliva itself, where the mucoid content is low, it probably would have a minor role in the buffering system. In sites where the concentration is greater, as we believe it is in most plaques on the teeth, it may play a most important part in determining whether caries is likely to be initiated in that region or not.

Mucoids and Caries.

Clinical observations indicate that ropy saliva is associated with dental caries. However, Lothrop and Gies[16] were unable to find a relationship between total protein or viscosity and presence or absence of caries. Karshan[17] also found no significant difference in total protein of stimulated and resting saliva between groups with active caries and no caries. Willsmore[12] and Rae and Clegg[18] similarly found no relation using activated saliva but Gorlin[9] found higher salivary protein values in caries immune individuals. However, insufficient precautions seem to have been taken when the viscosity was determined in the above investigations and probably the mucolytic enzymes reduced the viscosity before measurements were made.

To prevent this decrease of viscosity, which is accompanied by a breakdown or depolymerisation of the mucoid molecule, the saliva must be collected and stored under ice-cold conditions. The saliva can be kept for an hour in the refrigerator with no appreciable decrease in the mucoid content, but should not be kept for a longer period. Also the viscosity would need to be determined at a lower temperature than usual, as once room temperature is reached the viscosity is rapidly decreased. The possibility of using a specific enzyme poison suggests itself but there are no reports

of such use. The usual bactericides have no effect, as the enzymes can exist outside the bacterial cell and still be active.

Resting saliva should be used when attempting to find any relation between caries susceptibility and the constituents of saliva, because resting and not activated saliva is in contact with the teeth most of the time. Activated saliva is very watery and would not represent a normal sample.

Mucoid and Plaque.

In relation to dental caries, the role of the mucoids in plaque formation is probably more important than any of the other functions mentioned. Williams[19] in 1897 demonstrated the presence of a thick, felt-like mass of acid-forming micro-organisms covering caries of the enamel and called these films "bacterial plaques." Black[20] postulated that "caries of the teeth has its beginning where conditions are such that micro-organisms form gelatinous plaques by which they are glued to the surface." Other workers[21, 22] since Williams have also described the plaque, variously designated as bacterial, gelatinous and mucinous, as the cause of caries although Bibby[23] claimed that it can have a protective effect.

The idea of the mucinous origin of the plaque came from Kirk[24] who considered that mucoid or protein material from saliva was precipitated by acid-producing organisms. Mucoid itself was considered[25] to cause caries due to its acidity. However, this is very unlikely and could not be confirmed by Miller[26]. Other workers[27, 28] consider the plaque to be a bacterial mass clinging to the surface of the tooth, and some that it was derived from soft foods. Probably, however, the plaque is derived from all three sources, jointly, particularly bacteria and mucoid as it is protein in nature, and besides these components leucocytes and epithelial cells are also found[29].

Plaque and Caries.

On the relationship of the plaque to caries, experiments with the Syrian hamster showed[30] that plaque accumulation, periodontal disease and dental caries markedly increased as glucose increased in the diet. However, the accumulation of plaque material or the occurrence of periodontal disease was not always associated with caries. The latter irregularity could be due to the presence of more than one type of plaque, as the evidence of Campaigne and Fosdick suggests. These workers found[31] a variation in pH and nitrogen content, and also[32] that there are soft, comparatively easily removed plaques as well as tenacious ones.

Alternatively, the bacterial content may differ and it has been claimed[33] that a bacteriological examination would indicate whether the plaque had covered carious or normal enamel.

Plaque Formation.

Although it is generally accepted that caries is intimately associated with the plaque, the mode of formation and attachment to the enamel surface is little understood. Experiments in Fosdick's laboratory[14] indicate that the plaque is formed rapidly on the tooth surface whether food is ingested or not, although the formation is more rapid during the period when food is being eaten. It is believed that plaque formation is related to the mucoid content of saliva. Also there is evidence that during mastication there is an increase in the secretion of mucoid from the salivary glands and that this increase has a direct relationship to the ingestion of carbohydrate. Thus it is possible that carbohydrate ingestion can have an indirect effect on plaque formation.

That carbohydrate has a more direct role has been suggested by Keiser-Nielson[34] who studied "the intensely puddled pasty mass of mucin-carbohydrate" that is formed when carbohydrate is masticated. Due to its sticky nature this complex is claimed to fill every space where there is a chance of retention. Two alternatives then present themselves. He suggests that acid could be formed within the complex and the mucoid precipitated as a film. On the other hand, should fruit juices or tannic acid from tea be introduced into the mouth, the mucoid may be precipitated as long projecting threads which can be caught up by the tongue or coarse food particles and so removed from the areas of retention. Thus it can be seen that he suggests two diametrically opposite end results; one a possible predisposing mechanism and the other a protective mechanism.

How the mucoid is denatured and forms a tenacious film is unknown. Simple acid precipitation of mucoid *in vitro* gives a flocculent non-adhesive precipitate[35] so that unless different conditions hold *in vivo* this method of formation is impossible. Also it appears that quite a high acid concentration is required for precipitation of salivary mucoid. The isoelectric point, the pH value at which the solubility is at a minimum, is pH 2.75 to 2.95[6] for salivary mucoid. It is unlikely that this value can be reached by any acid-forming organism in the mouth. Stephan[36] studied the pH of plaques and cavities and found that of the plaques to vary between 4.6-7.0 and that of the cavities between 4.2 and 6.2. Thus it

appears that acid precipitation is unlikely as the method of plaque formation and that speculations on acid precipitation of mucoid are open to question.

An alternative method of formation has been suggested by Dobbs[8]. Mucus which collects on the teeth particularly during sleep may be denatured by alternate wetting and drying and transformed into a firm, resistant plaque. The process of drying can apparently denature certain mucoids. Ovomucin from egg white can be re-dissolved once it has been dried and the same seems to be the case with various impure salivary mucoid preparations. Thus (from the available data) this method of plaque formation seems more likely than acid precipitation. Salivary globulin[37], too, can play a part in plaque formation as it is precipitated by carbon dioxide, salts and water.

The plaque is attached firmly to the tooth surface, as one author[38] says, "almost as if it is attached by some sort of life process." The plaque has been vaguely stated generally to be glued on to the enamel surface by some problematic material of saliva.

However, Gottlieb[39] has suggested that the attachment is by invasion of the lamellae. By this means the plaque, consisting principally of bacterial accumulation, extends into the lamellar substance and becomes fixed to it. Thus, according to Gottlieb's theory, the plaque becomes tenacious after caries has begun. As there is no way yet to determine just when initiation of a carious lesion does occur[40], it would seem difficult to ascertain whether this mechanism is the cause of the tenacity of plaques.

However, the plaque is found in nearly all mouths regardless of dental condition so that either this mechanism is not universal or the development of the carious lesion is inhibited after the plaque forms. As previously stated, there is evidence for the existence of at least two types of plaque and Dobbs[8], who found whitened areas under thick plaques, reasoned that limitation of carbohydrate supply and accumulation of partially decalcified enamel had limited any further action.

Permeability of the Plaque.

Dobbs' results stress the importance of the permeability of the plaque to carbohydrate and ions. Stephan[41] first demonstrated that the plaque on labial and buccal surfaces, after the application of glucose, rapidly developed a pH sufficiently low to dissolve the enamel and it was shown[22] that plaque material produces considerable quantities of lactic acid from glucose, sucrose, fructose, maltose, lactose and starch.

Stralfors[15] suggests that the plaque has the ability to store acid and hinder saliva from neutralising it. This is because the buffering capacity of the plaque, which is believed to be substantially due to protein, is greater than the buffering capacity of saliva.

Using artificial plaques, the diffusion of synthetic detergents, urea and glucose was found[42] to be directly proportional to concentration and time of exposure and inversely proportional to the thickness of the plaque. Blayney[43] concluded from experimental data that there was no evidence to support the hypothesis that the plaque is a semi-permeable membrane.

However, Fosdick[14] in a recent review considers that, when concentrated sugar solutions are taken, the plaque and tooth act as a semi-permeable membrane, the sugar being forced into the plaque and water forced out. As a result of enzymic action acid is formed, the plaque remaining acid for 30 to 90 minutes while for the same period the osmotic pressure remains high. Whereas water molecules can freely pass out, the H^+ ions can only penetrate till they collide with a Ca^{++} ion. The apatite molecule is claimed to resist the passage of the H^+ ions and as a result is decalcified. This phenomenon takes place when concentrated sugar solutions are present but not with solutions which are isotonic.

Accordingly, it appears that the mucoid content of saliva is linked with the plaque and in turn with caries. If the mucoid content could be lowered the caries incidence might be lowered (although if there was no plaque at all the question of acid erosion might arise[14]).

Breakdown of Mucoids.

As the mucoids in the saliva can be broken down by enzymes called mucolytic enzymes or mucinases, these enzymes in turn might be concerned in the incidence of caries. When viscous saliva is allowed to stand at room temperature there is a decrease in the ropiness indicating that the mucoid has been broken down. This breakdown could be due to either or both of two factors: (i) the mucoid is unstable at room temperature or (ii) there is a mucolytic enzyme present. In regard to the first alternative, heating of gastric mucin is known to cause a marked decrease in viscosity[44] and Gottschalk[45] has found that storage of ovomucin even at 0°C. results in a similar decrease over a period of time.

The enzyme or enzymes could be bacterial or salivary, or both. Simmons[46] found evidence for the existence of an enzyme in saliva probably in the parotid secretion with mucolytic activity. On the other hand, Rogers[47] found that there are some groups or organisms in raw saliva able to break down the mucoids. This mucolytic enzyme was associated with cellular protein and was not formed by the salivary glands. These two findings suggest that mucolytic enzymes arise from both sources.

Recently in the Institute of Dental Research, organisms have been isolated from the mouth which, when incubated with sterile viscous saliva cause a decrease in viscosity. This is due to an enzyme present in the culture fluid so that an active enzyme preparation free of organisms can be obtained.

Whereas these organisms produce an exocellular enzyme, there are probably other organisms present in which the enzyme remains inside the cell, i.e., is endocellular. Meyers[48] found that the hyaluronidase from *Cl. welchii* is present in the culture fluid, but that the enzyme from *pneumococci* and *streptococci* is inside the cells.

However, whether the enzyme is exocellular or endocellular, the mode of action is the same. The enzyme reaction can be divided into stages: firstly, there is the decrease in viscosity which occurs fairly rapidly and is due to the depolymerisation of mucoid molecule; following this change there is the comparatively slow liberation of the components[49]. Whether these two stages are due to one enzyme or a series of enzymes is not known. Studies on *Cl. welchii*[49] indicated a single enzyme but crude testicular extracts contain two enzymes[50], one depolymerising hyaluronic acid and the second liberating sugars. Comparison with the enzyme action on starch and protein suggests more than one enzyme but for saliva there is no definite evidence to indicate which is the case.

The mucolytic organisms which we have isolated from the mouth are ammonia-producing gram-negative rods. The presence of certain members of the genus *Bacterium* is believed to be related to the absence of caries because of the production of ammonia[51] but there mucolytic activity might be a contributing factor.

Mucoids of the Teeth.

So far only the mucoids in saliva have been considered but there is also evidence for their occurrence in teeth, both in the enamel[52] and dentine[53, 54]. Pincus[52], after exposing enamel to 2% HCl was able to show the presence of hexosamine, hexonic acid and uronic acid in the acid-resistant material. It is not known where in enamel the mucoid is situated, but in the dentine[54] an acid mucopolysaccharide has been shown to be present in the walls of the tubules. Recently Engel[55] has shown that unaltered normal adult dentine does not give the reaction for polysaccharide by the Hotchkiss method, but carious dentine does, and this is presumed to be due to depolymerisation when the reactive groups are liberated. Engel[55] has demonstrated that carious dentine contains hyaluronidase[55] and also micro-organisms invading the lamellar substance have been shown to produce acid *in situ*[56]. The acid could arise from the fermentation of the carbohydrate formed by the hydrolysis of the mucoid. This would support Gottlieb's theory that invasion of the lamellar substance precedes plaque formation for the organisms would obtain their energy requirements from the tooth itself.

Conclusion.

In conclusion, it is apparent that the mucoids are an important component of saliva. Of the several physical and chemical functions that have been suggested, the most important is probably their role in plaque formation. As the plaque is intimately associated with dental caries, caries susceptibility would be expected to be related to the mucoid content. Although clinical observations indicate this is the case it has not yet been possible to verify this fact experimentally. However, in an investigation of the mucoid content under controlled conditions, the presence of mucolytic organisms and caries susceptibility may well show that a relationship does exist, and a new field of preventive dentistry will then be opened up.

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Dental Materials*

Current Notes No. 14

NEW LIGHT ON AN OLD PROBLEM. THE MARGINAL SEAL OF FILLINGS CHECKED BY RADIOACTIVE TRACERS.

For some years, even before the advent of atomic energy as a prolific source of radioisotopes, radiocompounds have been used in the elucidation of medical and dental problems. Built into the structure of such compounds are atoms which have been made radioactive by bombardment in the cyclotron or the atomic pile. The radioactivity induced in some elements is too fleeting to be of use in biological research but many have a half-life long enough for experiments on metabolism,

*Contribution from the Commonwealth Bureau of Dental Standards.

for example, to be completed before the radiations become too weak. The radiation intensity may be detected by the now-familiar Geiger counter or by means of radioautographs where the biological material under test is placed in contact with a photographic plate to produce an image corresponding to the distribution of the radioactivity.

Until recently the dental applications of radioelements have been confined to questions of the permeability of enamel, and the metabolism and absorption by the hard tissues of compounds, particularly phosphates and fluorides. To a large extent this work has been governed by the availability of the various radioisotopes but there is already sufficient to clarify many dental problems as may be seen from such papers as have been listed in the Tracer Element Bibliographies issued by the Commonwealth Scientific and Industrial Research Organization[1]. (For a summary of papers on the use of radioactive tracers in problems associated with caries the bibliography published by the National Research Council of Canada[2] will be found useful.)

The first published application of radioisotopes to the science of dental materials is described in two recent papers. In a short preliminary report Armstrong and Simon[3] give their results on the penetration of radiocalcium at the margins of various filling materials. Previous to these experiments it was necessary to use penetrating materials which had to be detected by visual or chemical means. Dye molecules used for the former method were often too large to enter the marginal spaces around fillings and, on the other hand, if the substances normally found in and around the tooth were used as they should be, the sensitivity of the chemical methods usually left much to be desired.

These difficulties can be overcome as demonstrated by Armstrong and Simon when they used a solution of a radiocalcium salt in which was immersed for 48 hours teeth containing various fillings. On sectioning and obtaining radioautographs it was found that there was no penetration into self-hardened acrylic resin, amalgam, zinc phosphate restorations, a little penetration into gold foil and more into silicate cement. The solution penetrated the margins of all the filling materials but in varying amounts, there appearing to be least with amalgam. The report is admitted to be of a preliminary nature and it certainly gives the impression that the tests will have to be repeated a few more times before arriving at any definite conclusions.

In another paper, Wainwright[4] in discussing the penetration of tooth enamel by various radioactive salts including calcium, zinc and copper, makes incidental reference to the penetration of silicate restorations which were present in some of the teeth. The restorations of two teeth taken from the same mouth were penetrated completely by the radiocalcium but, curiously, on washing for four hours under running tap water the tracer was washed out of one silicate restoration and not the other. The walls of both cavities, however, retained the radiocalcium even after washing. In some teeth with amalgam fillings and tested with radiozinc and radiosilver, some leakage at the margin of the amalgam was noted but in others there was no penetration.

In an editorial[5] commenting on these two papers, attention is drawn to the number of substances now available (in the U.S.A.) in radioactive form and reference is made to penicillin, sodium iodide, thiamin, urea, gold, copper and water. To encourage further work with tracers, a sub-committee appointed by the American Dental Association is preparing a summary of sources of information, precautions against radiation hazards, and a list of dental atomic investigators, and this is to be published in its journal. The final paragraphs of the editorial are worth quoting:

> "Radioisotopes enable the investigator to trace the movement and localization of medicaments and biologic compounds with precision and accuracy a million times more decisive than is possible by ordinary chemical methods. Because of the minute and slow nature of many dental changes, information regarding the action and safety of dental material can, in many instances, be obtained by no other method.
>
> "One of the major responsibilities of dentistry now is to establish a programme of synthesis of radioactive compounds of dental interest so that these new tools can be employed for the improvement of dental service."

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The DENTAL JOURNAL of AUSTRALIA

Editorial Department

13th Australian Dental Congress

The 13th Australian Dental Congress will be held in Brisbane from 1st to 5th June, 1953, and in order to ensure that participants in this meeting are given ample time to prepare their contributions, members' attention is being called to this most important professional interstate gathering and the following information is now available.

The site of Congress will be the Brisbane Dental School, an imposing stone building now nearing completion, set in four acres of parkland within the Brisbane University. All lectures and clinics will be conducted at the Dental School, except those in General Anaesthesia, and members will be able to spend the entire day at the Congress with the minimum of travelling and inconvenience.

The Dental School has nine lecture theatres, one capable of seating 250 persons, and an area for the Trade Exhibit centrally located on the ground floor of the building, as well as ample facilities for table clinics and other presentations.

The President of Congress is Professor S. F. Lumb, Dean of the Faculty and Professor of Dentistry at the University of Queensland, and the President and his committee are making every effort to ensure that this coming Congress will be of advantage to every member attending; although the purpose of Congress is to appeal particularly to the general practitioner in dentistry, the specialist will not be forgotten.

The Vice-Chairmen of the various Sections for New South Wales are:—

Oral Surgery and Anaesthesia: Professor A. J. Arnott. Prosthodontia: Dr. A. G. Rowell. Operative Dentistry: Mr. J. S. Lyell. Crown and Bridgework, and Ceramics: Mr. W. Alan Grainger (during Mr. Grainger's absence overseas Mr. N. W. Kestel is acting for him). Periodontia: Mr. G. Morse Withycombe. Orthodontics, Pedodontia and Preventive Dentistry: Mr. R. Harris. Dental Services: Mr. J. W. Skinner. Radiography, Clinical Photography and Film Programme: Mr. R. Harris. Research: Mr. N. D. Martin. Dental Health Education and Social Dentistry: Mr. N. D. Martin. Pathology and Bacteriology: Mr. D. A. Cameron.

If any member is desirous of contributing any lecture or clinic of any description to Congress, he should contact the Vice-Chairman of the appropriate Section for information and advice.

Vice-Chairmen will welcome a wholehearted response from members in this regard, as the high quality of contributions of members of this Branch to previous Congresses has established a standard which, if zealously maintained, must only serve to benefit the profession as a whole.

Correspondence

"Maxillary Conduction Anæsthesia"

Sir,

I read with great interest the paper presented to the 12th Australian Dental Congress by C. H. Ritchie on "Maxillary Conduction Anaesthesia."

However, I wish to query his statements, "Thus there exists an outer and an inner nerve loop which, if both anaesthetised, give perfect anaesthesia of the maxilla as far forward as the bicuspid region," and later, "In

order to anaesthetise the premaxilla other injections are necessary."

The idea that a maxillary block injection will only produce anaesthesia of a part of the upper jaw is one with which I also have agreed until recently, despite the fact that such results do not accord with the anatomical distribution of the second division of the fifth cranial nerve. Since T. R. Corbett and I[1] presented our paper on Block Anaesthesia of the Maxillary Nerve, in which we also stated: "anaesthesia . . . in most cases extends only to the first premolar . . . ," I have experimented further and given a great deal of thought to this anomaly.

I am now convinced that true maxillary block anaesthesia is no different from a block of the inferior dental nerve and that anaesthesia should and can be produced to the mid-line except for minor anastomosis.

I am also convinced that where complete unilateral anaesthesia is not achieved the block is a partial failure, and only the posterior and middle branches of the nerve have been anaesthetised.

This accords with the distribution of the nerve and is borne out by the clinical results which can be achieved.

I have now recorded quite a number of these cases. To quote one will suffice:—

1. Corbett, T. R. & Helmore, F. E.—Block anaesthesia of the maxillary nerve via the greater palatine foramen: Proc. 11th Aust.Dent.Congress, 1948, pp. 137-145.

Mrs. E. was referred on 9/5/52 with acute abscess of the upper right lateral incisor evidenced by swelling and tenderness. X-ray revealed a small cystic area at the apex and it was decided to remove the tooth under penicillin cover, obtain drainage and later open the area for thorough enucleation of the cyst. Maxillary block anaesthesia was obtained by injection of three cc. of XYLOCAINE by palatine canal approach, a few minims of anaesthetic being placed over the upper left central incisor to eliminate the effects of anastomosis. Perfect anaesthesia resulted in seven to eight minutes and the lateral incisor was removed uneventfully.

The whole point of this letter is that I feel we have not set ourselves a sufficiently high standard in the past, and while it is not claimed that all of these injections result in the perfect anaesthesia described above, that is the standard at which we should aim.

One warning should be given—while maxillary conduction anaesthesia may appear simple in the hands of an operator as highly competent as Mr. Ritchie, it should not be attempted by those who are not prepared to approach it with great care after very thorough study. In other words, it is not quite as easy as he makes it appear.

Yours faithfully,

F. E. Helmore.

217 Macquarie Street,
Sydney.
3rd June, 1952.

"Salivary pH"

Sir,

A patient recently presented with about 12 very large carious cavities.

In the course of conversation I discovered that this patient is a research worker at the Zoology Department, University of Sydney.

She is daily using a very sensitive electrolytic pH meter, so I suggested that she take pH readings of her saliva.

This she has commenced doing with the following preliminary findings:—

13/6/52:	12.30 p.m.	pH 6.0
	12.45 p.m.	pH 6.3
	3.10 p.m.	pH 7.3
	4.00 p.m.	pH 5.0
14/6/52:	11.30 a.m.	pH 6.0
	12.50 p.m.	pH 6.0
	2.00 p.m.	pH 6.0
	2.30 p.m.	pH 5.6
	4.00 p.m.	pH 7.3
15/6/52:	10.00 a.m.	pH 7.3

As pH 7.0 is neutral, it seems that there are long periods when this patient has a definitely acid saliva, and this might be the case with many caries-susceptible patients.

These findings made me think back to the plenary session of our last Dental Congress in Sydney, when much was said about bacterial plaques but little concerning the pH of saliva.

It has been my opinion for many years that research should be directed towards correlation between diet and salivary pH values and I now pass on these observations and suggestions for what they are worth.

Yours very sincerely,

S. A. M. Tout.

179 Pacific Highway,
Hornsby.
23rd June, 1952.

News and Notes

Australian Dental Association Standards Committee

LIST OF CERTIFIED DENTAL MATERIALS.

In the time that has elapsed since the last list was issued by the Association, the scope of the scheme has been enlarged by the addition of three new Standards for Dental Impression Plaster, Dental Laboratory Plaster, and Dental Modelling Compound.

Whilst it will be noted that no products of these types appear in the list, it should be pointed out that this is due to the recent promulgation of the specifications concerned, and that sufficient time has not elapsed for the carrying out of the testing required before a material can be listed as certified. The specification for Modelling Compound also requires some technical amendment before its application. The listing of these products will appear later as an addendum to the list now published.

In bringing the present list before the profession in Australia, the Standards Committee wishes once again to stress the importance of members consulting the list when buying their supplies of materials.

CERTIFIED DENTAL MERCURIES (A.D.S. No. T 1):—

Mercury.	*Manufacturer or Distributor.*
A.D.P. Mercury	Mitchell Dental Supplies.
Ash Chemically Pure Mercury	Amalgamated Dental (Aust.) Pty. Ltd.
Bosch Mercury	Bosch Naylor Pty. Ltd.
Glover & Goode Dental Mercury	Glover & Goode Pty. Ltd.
M. & B. Mercury B.P. Redistilled	May & Baker (Aust.) Pty. Ltd.

CERTIFIED DENTAL AMALGAM ALLOYS (A.D.S. No. T 2):—

Amalgam Alloy.	*Manufacturer or Distributor.*
Baker's Aristaloy	Baker Platinum Ltd., London. (N.I.A. Investments, Pty. Ltd.)
Bosch Alloy	Bosch Naylor Pty. Ltd.
Bosch 70% Alloy	Bosch Naylor Pty. Ltd.
Crompton Alloy (67%)	Crompton Dental Products.
Crompton 70% Alloy	Crompton Dental Products.
F. & G. 70% Alloy	Felton Grimwade Dental Co.
G. & G. Quick Setting Alloy (Standardised)	Glover & Goode Pty. Ltd.
G. & G. 70% Alloy	Glover & Goode Pty. Ltd.
Jendent 68 Alloy	John T. Jennings Pty. Ltd.
K. & L. Alloy	Kemp & Liddell Pty. Ltd.
Premodent Alloy	Milne Browne & Co. Ltd.
"Six Eighty" Dental Alloy	Garrett, Davidson & Matthey Pty. Ltd.
Solila Alloy Quick Mixing	Amalgamated Dental (Aust.) Pty. Ltd.

CERTIFIED ZINC PHOSPHATE CEMENTS (A.D.S. No. T 3):—

Cement.	*Manufacturer or Distributor.*
Dalton's Zinc Cement	The Dalton Chemical Co.
De Trey's Cement (Improved)	Amalgamated Dental (Aust.) Pty. Ltd.

Post-Graduate Courses in Dental Science, University of Sydney

There are some vacancies in the following courses of instruction. Members of the profession desirous of attending any of the under-mentioned courses should communicate with the Secretary of the University of Sydney, Post-Graduate Committee in Dental Science, Dental Hospital of Sydney, Chalmers Street, Sydney.

A. J. Arnott,
Chairman.

Course No. 24: Inlays.
3rd November, 1952, to 7th November, 1952. Enrolment limit—12.
Clinicians: Mr. W. A. Grainger, M.D.S., and Dr. E. H. Bastian.

This course will consist of a series of lectures, demonstrations and practical classes. The aim of the course is to discuss the fundamental theories of gold inlay techniques and to put into application the new methods of obtaining precision castings. Cavity preparations and modifications will also be discussed at some length.

Course No. 25: Endodontia.
17th November, 1952, to 21st November, 1952. Enrolment limit—12.
Clinicians: Mr. J. S. Lyell, M.D.S., Mr. T. Ludwig, B.D.S., and Mr. C. H. Ritchie, B.D.S.

This course will consist of a series of lectures, demonstrations and practical instruction in the principles and modern methods of root canal treatment, with special reference to anterior teeth. The anaesthesia and oral surgery (apicoectomy) connected with this subject will be included in the course. An opportunity will be given to members attending this course to carry out all the stages of treatment demonstrated.

The Post-Graduate Committee in Dental Science announces that the following course in Radiology and Oral Diagnosis will be conducted.

Course No. 29: Radiology and Oral Diagnosis.
23rd February, 1953, to 27th February, 1953. Enrolment limit—15.
Clinicians: Dr. F. McEncroe, Dr. E. Stanley Wallace, Mr. R. Harris, M.D.S.

This course is planned to provide lectures and demonstrations in the technique of intra- and extra-oral radiology, together with elementary physics of radiology, nature and properties of x-rays, with dangers and protection in the use of x-rays and general principles on x-ray diagnosis. The radiologic survey and interpretation, both intra- and extra-oral of:—(i) the normal child, pre-eruptive to eight-year period, (ii) the normal child, pre-adolescent to maturity period, (iii) the adult, dentulous and edentulous, (iv) differential diagnosis between anatomical landmarks and indications of abnormalities and pathological conditions. Interpretation of anomalies and abnormal development, hypoplasia, dental caries, periapical lesions, root resorption and periodontal diseases, (v) root canal therapy and location of foreign bodies and root fragments.

Oral diagnosis will cover the technique of complete history taking, examination of the patient and the use of various diagnostic aids and correlation and evaluation of these findings. General dental and oral conditions with particular reference to inflammatory conditions of the gingivae and mucosae, infections of bones, dysplasias and chronic inflammatory conditions, cysts, tumours of the soft and hard tissues and neuralgias.

The course is planned to provide both practical and clinical demonstrations at various stages.

13th Australian Dental Congress

The Federal Secretary of the Australian Dental Association, Mr. Norman Edney, visited Brisbane on 26th June to confer with the Congress Commission. The President of the Congress Commission, Professor Lumb, Dr. Brian Ferguson and Dr. F. Vincent were among those that welcomed Mr. Edney on his arrival in Brisbane.

The Secretary, after being familiarised with the proposed organisation of the Congress, reported to the Federal Office in a most enthusiastic manner concerning the ideal arrangements.

A.D.A. Dental Research Scholar

B. Lilienthal has been awarded a Doctorate of Philosophy from the University of Oxford for research work carried out during his tenure of the Walter and Eliza Hall and Australian Dental Association, New South Wales Branch, Research Scholarship.

Dr. Lilienthal is leaving England for Australia at the end of July to take up work in the Institute of Dental Research.

Italian Dental Association Holds XXVIIth Congress

During the second half of October, 1952, the XXVIIth Congress of the Italian Dental Association and the 1st Triennial International Dental Prosthetic Meeting will be held in Rome.

The topics for discussion are as follows:—

(1) Children's Dental Therapy.
(2) Physiology of Mastication in Relation to Prosthetics.
(3) Lesions of the Soft Tissues of the Mouth.
(4) Analgesia and Anaesthesia.

Of special interest in the 1st Triennial International Prosthetic Meeting will be an exposition of "The Advancement of Dental Prosthetics through the Centuries."

New American Dental Association Publication on Fluoridation

The Council on Dental Health of the American Dental Association has recently published an 18-page pamphlet on promoting a fluoridation programme.

The *Dental News*, Issue No. 27, April, 1952, publishes a useful extract which will be of assistance to those engaged in furthering the acceptance of fluoridation:

Do . . .

Describe fluoridation as a "nutritional," "tooth-building" or "public health" measure.

Describe fluoridation as "adding fluoride to water deficient in this mineral," "supplementing water with fluoride," . . . "fortifying our water with fluoride," "controlled fluoridation."

Describe the *objectives* of fluoridation as "building stronger teeth which are more resistant to dental decay."

Point out that the dental society's backing fluoridation is part of its pledge to do everything possible to improve the dental health of the people, especially children. At all times maintain the position that as a professional man, your sole objective is to present the latest scientific, factual data on fluoridation in an objective and helpful way, so the public may be fully informed of its benefits. The dentist and his society are "urging" and "requesting" consideration of fluoridation. They are *not* "insisting" on or "demanding" it.

Keep statements positive, in terms of what fluoridation has been proved to accomplish, what it will accomplish in your community. You have all the evidence on your side.

Keep statements positive, confident and optimistic. Fluoridation is a nutritional measure. It is endorsed by practically all professional and scientific bodies.

It *will* cut tooth decay in future generations by 60-65%.

Emphasize that over 200 American communities are presently (Feb., 1952) fluoridating their drinking water, that many have been doing it for several years, and that hundreds more are presently considering the matter or have approved it.

Do not . . .

DO NOT refer to fluoridation as "therapeutic," "medicative," "artificial," "experimental."

DO NOT refer to fluoridation as "treatment" of water, "mass medication," or "mass treatment." Avoid such terms as "injecting fluorides into the water supply." This implies a medicative procedure.

DO NOT let opponents of fluoridation involve you in "mud-slinging" or "name-calling." Never put yourself or the dental society in the position of seeming to "insist on" or "demand" fluoridation.

NEVER question the sincerity of any opposition, or their right to fully express their views. *NEVER* attack any individual or group which may be opposed to fluoridation on religious grounds.

AVOID NEGATIVE ARGUMENTS.
Never repeat the opposition's assertions that fluoridation is "adding a harmful chemical to water," or that fluoridation may have injurious systemic effects. Counteract such assertions with positive re-statements of the actual facts. Repeating misstatements, even for purpose of denial, only gives them wider circulation.

DO NOT engage in arguments with individuals, nor attempt to defend every assertion made by the opponents. Your conviction of the benefits and safety of fluoridation is based on study by all the recognized health authorities in the United States. You do not need to defend your conviction on the basis of personal technical knowledge.

British Commonwealth Index of Scientific Translations

The British Commonwealth of Nations Scientific Liaison Offices in London have started a Commonwealth Index of Scientific Translations. Each of the Commonwealth countries has or will have an agency which is to maintain a central index of translations into English of published scientific papers, reports and journal articles which have been made by various organizations within the Commonwealth. Each agency collects details of translations made by the organizations in its own country that are co-operating in the scheme; the information is then passed on to the British Commonwealth of Nations Scientific Liaison Offices, London, where index cards are prepared and sent out to the agencies within the Commonwealth.

The Australian agency for this index is the Information Service, Commonwealth Scientific and Industrial Research Organization, 314 Albert Street, East Melbourne, C.2, Victoria.

Persons in Australia wishing to know if a certain translation is available should apply to the Senior Information Officer at the above address.

University of Western Australia Chair of Dental Science

Applications are invited for the Chair of Dental Science in the University of Western Australia. The Professor of Dental Science is also Dean of the affiliated Western Australian College of Dental Science and the Dental Hospital, where most of the teaching activities of the Faculty are carried out. The salary offered is at the rate of £2,100 per annum plus cost of living allowance, at present £200 per annum. The position is superannuated under a scheme similar to the British F.S.S.U. Copies of conditions of appointment may be obtained from the registrars of universities and university colleges in Australia and New Zealand. Applications close with the undersigned on 15th September, 1952.

A. J. WILLIAMS,
Acting Registrar.

University of Otago, Dunedin, New Zealand

SENIOR DENTAL SURGEON.

Applications are invited from qualified Dental Practitioners for the position of Senior Dental Surgeon at the Dental School and Hospital. In addition to taking charge of the

Hospital section, the successful applicant will be responsible for the clinical teaching of Oral Diagnosis, and will have the status and salary of a Senior Lecturer.

Salary range: £1,360-£1,560.

Further particulars may be obtained from the undersigned, or from the Secretary, Association of Universities of the British Commonwealth, 5 Gordon Square, London, W.C.1. Applications close in New Zealand and London on September 1, 1952.

J. W. HAYWARD,
Registrar.

Perth Dental Hospital Superintendent

Applications are invited by the Board of Management for the position of Superintendent which becomes vacant early in 1953. The Hospital has recently been enlarged and re-equipped and is the teaching school for the Faculty of Dental Science with which the Hospital is intimately associated.

The present salary range is £1,290 to £1,590 p.a. Other conditions of employment are similar to those of the State Public Service.

Applications close on 30th September, 1952, with the undersigned from whom further particulars may be obtained.

R. L. HUTCHINSON,
Secretary.

179 Wellington St.,
Perth, W.A.

Department of Health, Victoria School Dental Officer (Male or Female)

THREE VACANCIES.

Applications, addressed to the Secretary to the Public Service Board, Treasury Place, Melbourne, C.2, Victoria, and accompanied by evidence of experience and qualifications and a statement of date and place of birth, are invited for the abovementioned positions up to Wednesday, 10th September, 1952.

Yearly salary: Male — £1,324, minimum; £1,574, maximum. Female—£1,121, minimum; £1,199, maximum (including cost of living adjustment).

Duties: To perform dental duties, as directed, at the School Dental Centre and visit country areas with mobile dental units.

Qualifications: To be a legally qualified dentist registered in Victoria, and to possess approved university qualification with appropriate dental experience.

Journal of Prosthetic Dentistry

Through an oversight on the part of the distributors the Commonwealth Bureau of Dental Standards did not receive any of Volume 1 of the *Journal of Prosthetic Dentistry* and unfortunately supplies are now exhausted. The Bureau is anxious to obtain the missing 1951 numbers and makes this appeal in the hope that some reader may have copies which he no longer requires.

Journals Required

Copies of the January-February, 1952, issue of *The Dental Journal of Australia have* unexpectedly been exhausted, and the office of the Association would be grateful for any copies which are no longer required.

Dental Surgery Available

Dental surgery available for letting. New building, Fairfield, at Railway Station, 3 rooms. Available September. Brown & Goldie, UB 1339, Fairfield.

Space for Dental Surgeries

Adequate space available for dental surgeries in modern office block nearing completion in heavily populated Kings Cross/Rushcutters Bay district. Eastern Suburbs transport, including eight 'bus routes stop at door.

Waratah Chambers, 137-141 Bayswater Road, Rushcutters Bay. Phone: FA 4230.

Annual Sports Day

The Association's Annual Sports Day for 1952 was held at the Lakes Golf Club on Thursday, 10th July, 1952. A large attendance of members took part in both Golf and Bowls competitions and the day proved most successful and enjoyable.

Winners in the various events are as follows:—

GOLF.

Moxham Cup

Winner: K. O. Binns—1 up.
Runner-up: J. A. Whitty—square.

Best Score v. Par

A Grade: T. Purtell—2 down.
B Grade: N. R. Lock—square.
C Grade: J. L. Hardwick—2 down.

1st Nine: F. E. Helmore—square.
2nd Nine: P. J. Anderson—2 up.

Four Ball Best Ball v. Par

Winners: E. H. Bastian and N. R. Lock—5 up.

Runners-up: A. O. Watson and J. A. Hodgkinson—4 up.

Long Drive

G. Gow-Gates.

BOWLS.

J. V. Hall Best Trophy—Progressive rink competition

Winners: W. Chesher, G. K. Allen, Q. Harvison, C. Adair.

Runners-up: J. L. Gibbs, H. N. Taylor, A. French, F. R. Reid.

The Sports and Social Committee wishes to thank all members attending and to express its appreciation of the facilities made available by the Lakes Golf Club.

University of Queensland, St. Lucia, Brisbane, where the 13th Australian Dental Congress will be held from 1st to 5th June, 1953.

Association Activities

Australian Dental Association (New South Wales Branch)

GENERAL MEETINGS.

May

The Ordinary General Meeting of the Association for the month of May was held on Tuesday, 27th May, 1952, on which occasion the lecturer was Mr. H. Burrows of Orange. Mr. Burrows' excellent lecture on "Amalgam Restorations" proved of great interest and benefit to members attending.

This General Meeting unanimously elected T. T. Alkin, Esq., an Honorary Member of the Association for the year 1952.

June

An Ordinary General Meeting of the Association was held on Tuesday, 24th June, 1952. On this occasion the lecture set down was a conjoint one, entitled "Radiography and the Dentist." Dr. E. R. Magnus, one of the two lecturers for the evening, presented a graphic and interesting lecture. To the regret of members Dr. J. Burgess was unable to present his portion of the lecture due to sudden illness.

July 7

An Ordinary Meeting of the Association was called for Monday, 7th July, 1952, as it had been ascertained that Dr. J. M. Schweitzer of New York would be spending several days in Sydney over that period and would be kind enough to lecture to the members of the Association.

Dr. Schweitzer presented to the members a very fine lecture on "Partial Denture Procedures," showing an extensive selection of excellent colour slides to illustrate his subject.

Members present were most appreciative of this opportunity to hear an outstanding overseas practitioner.

Presentation to Past Presidents

The General Meeting of the Association of 24th June, 1952, was the occasion of a presentation to Mr. N. E. Edney and Dr. E. R. Magnus, Past Presidents of the Association during 1948-49 and 1950-51 respectively.

The President, Dr. A. G. H. Lawes, supported by Dr. J. V. Hall Best, Federal President, and Dr. F. E. Helmore, a Vice-President of this State Branch, expressed the appreciation of the members of the Association of the untiring efforts of these two members over a long period of years in the various offices held by them leading to their election to the presidency and of their able and distinguished conduct of all these offices.

The presentation of a suitably inscribed painting was made to Mr. N. E. Edney and a canteen of cutlery suitably inscribed was presented to Dr. E. R. Magnus. Both Dr. Magnus and Mr. Edney thanked the members for the presentations and for their support and confidence during their terms of office.

EXECUTIVE REPORT.

The Executive met on 16th June, 1952, and 14th July, 1952, and the Conjoint Meeting of the Delegates of Divisions and the Executive took place on 23rd June, 1952, and the Executive wishes to report to members the following matters:

Industrial matters

The Dental Assistants and Secretaries (State) Award, having expired, is the subject of an application for a new Award to the Industrial Commission of New South Wales by this Association. It is understood that the matter will be heard towards the end of July.

Hardwick Memorial Library

The Executive has decided to purchase for the library the last three volumes of the "Index to Dental Literature," published by the Bureau of Library and Indexing Service of the American Dental Association, in order to complete this series of volumes dating back to 1839.

Conjoint Meeting of Executive and Delegates from Divisions

The Conjoint Meeting of the Executive and Delegates from Divisions for 1952 took place on Monday, 23rd June.

Delegates appointed by each Division met during the day and discussed numerous matters raised by the Divisions, formulating formal motions to be discussed during the Conjoint Meeting with the Executive held during the evening.

CONSIDERATION OF THE RECOMMENDATIONS OF THE CONJOINT MEETING

The Executive at its meeting on 14th July, 1952, considered the recommendations from the Conjoint Meeting of Delegates from Divisions and the Executive of 23rd June in relation to the following matters:—

Import restrictions on dental supplies

The recommendations of the Conjoint Meeting were discussed and it was considered that actions of the Association to date adequately covered these recommendations. It was also decided that members would be advised further in this matter by Newsletter.

Fees for hospital dentures

Consideration was given to the recommendation of the Conjoint Meeting in this regard and the Executive's decision will be conveyed to the secretaries of country divisions for circulation to their members.

Country Conventions

Following consideration of the recommendation from the Conjoint Meeting, the Executive decided that the holding of country conventions in years other than Congress years be encouraged and that the matter of the formulation of a set of rules for the conduct of such conventions be referred to the Committee on the Articles of Association.

Fluoridation of drinking waters

The recommendations from the Conjoint Meeting in this matter were noted by the Executive who considered that the existing policy of the Association and the action proposed to be taken by the Association, as laid down by the Executive, covered the recommendations.

The Executive decided that upon request from Divisions the co-operation of the Dental Health Education Department of the Association would be available to Divisions in publicising the benefits of fluoridation of drinking waters.

Training of dental nurses

The Executive noted that the Conjoint Meeting supported its action towards provid-

ing a training scheme for dental assistants and that the Conjoint Meeting considered such a training scheme most desirable.

Disposal and purchase of practices

The Executive has decided to accept certain recommendations from the Conjoint Meeting in this matter and has referred these recommendations to the Officers for enquiry.

By-laws of the Association re Divisions

The Executive noted that the Conjoint Meeting was in favour of the suggested amendments to the By-Laws of the Association re Divisions, with the exception of the proposed amendment to By-Law (10). The recommendation of the Conjoint Meeting in this matter was fully considered, but the Executive found itself unable to adopt the recommendation.

Notices re dentistry in migrants' hostels

The Executive decided that information on oral hygiene be given to migrants at migrant centres under the auspices of the Dental Health Education Department when funds permit.

Change of Directory of Membership in the Journal

The Executive considered the recommendation of the Conjoint Meeting and the recommendations of the Journal Committee in this matter and decided that the Directory of Members usually published in *The Dental Journal of Australia* should be arranged in such a way as to group members as metropolitan (Sydney) members and members residing within the areas of the various country Divisions, with a cross index to towns in the areas of such Divisions.

MEMBERSHIP

Full members

Arnold, Lionel Rupert, B.D.S.; Carrigan, Neil Lawrence, B.D.S.; Chapman, Edwin Charles, B.D.S.; Cooke, Graham Gaude, B.D.Sc.; Finch, Brian Harold, B.D.S.; Garrick, Desmond Noel, B.D.S.; Goodall, Leonard Ross, B.D.S.; Halliday, Edward John, B.D.S.; Jenkins, Harold Francis, B.D.S.; Matthews, Terry, B.D.S.; Meldrum, Thomas Alfred, L.D.S., R.C.S.; Osborne, Kenneth Gordon, B.D.S.; Pickering, Richard Bray, B.D.S.; Regan, Gregory Peter, B.D.S.; Robinson, Frederick Veitch, B.D.S.; Sheldon, Alan Eric, B.D.S.; Suhr, William Francis, B.D.Sc.; Waterer, Frederick John, B.D.S.; Wayland, Samuel Hugh, B.D.S.

Deceased

Ormiston, Joseph Mervyn; Pennell, John William.

Student Associates

Brodie, Malcolm Sydney; Craig, John Edward; Daley, John Francis; Davis, Gregory Thomas; Dickinson, Allen Albert; Eslake, Edward John; Hudson, Reginald William; Kah, Ho-Ling; Leaver, Richard Fielding; Lester, Brian William; Lilley, David John Alan; McKenzie, Roslyn; Purnell, Frank Edward; Purtell, Yvonne Dawn; Powers, Jack Milton; Simpson, James Russell.

New Books and Publications

PHARMACOLOGY AND DENTAL THERAPEUTICS, by Edward C. Dobbs and Hermann Prinz, St. Louis, 1951. *10th edition.* C. V. Mosby Co. (600 pp., 35 illus.). Price 89s. 3d. *Our copy by courtesy of W. Ramsay (Surgical) Pty. Ltd.*

The tenth edition, like its predecessors, covers a wide range of subject matter divided into two parts and including Materia Medica, Pharmacology and Therapeutics. Chapters 1 to 14 deal fairly adequately with the effect of drugs on the body systems and indicate clearly modern thought regarding the use and abuse of the drugs in common use. Chapter 8 deals with local anaesthetics and includes a monograph on XYLOCAINE which has recently achieved prominence locally. Regarding pulpal anaesthesia for endodontia and operative dentistry, the complete inadequacy of procaine is stressed irrespective of the strength of its solutions. The need for some efficient local anaesthetic for conservative dental operations is a most urgent one, and a ray of hope appears in the acetanilide derivatives such as XYLOCAINE. Chapter 15 deals with chemotherapy and antibiotics in rather brief and sketchy fashion and mentions their limited use in the dental sphere. Chapter 17 inadequately handles the vitamins, especially vitamin K, and dietary factors in general. Antiseptics are presented very fully in Chapter 19, notable omissions being chlorinated xylenol (DETTOL), and up-to-date information regarding the use of modern detergents in surgical procedures. The antiseptics of choice would appear still to be the acridine dyes (acriflavine, MONACRIN, etc.) and silver proteinate (ARGYROL, NEO-SILVOL, etc.).

The second part of the book, Chapters 23, 24 and 25, encompasses the subject of therapeutics and it is in this respect that this book fails so obviously to be of real use for practitioners outside the U.S.A. The reader is handicapped by the marked disparity in the official names, strengths and dosages of common drugs used both in the U.S.A. and in the British Empire. Many drugs are known by quite different names and preparations containing them are also different; consequently the information presented may be quite misleading for Australian readers, for example, the formulae made up to a pint, which is 16 fluid ounces U.S. instead of 20 fluid ounces in the Empire countries.

It would seem that the approach to pharmacology and therapeutics lies rather towards a book of applied pharmacology to be supplemented by reference to some local book of formulae such as a Hospital Pharmacopoeia or the Australian Pharmaceutical Formulary.—*T. F. Pyke.*

ORAL REHABILITATION, by Jerome M. Schweitzer, St. Louis, 1951. C. V. Mosby Co. (1161 pp., 1157 illus.). Price £10 10s. 0d. *Our copy by courtesy of W. Ramsay (Surgical) Pty. Ltd.*

The subject matter of this textbook may be divided into three groups, the temporomandibular joint, occlusion and techniques used in occlusal reconstruction.

In dealing with the temporomandibular joint the author has reviewed present day knowledge on the development, pathology and histopathology of the temporomandibular joint. That so much of this material is highly contentious is borne out by the author's efforts in dividing the material into groups of authorities who hold that malposition of the temporomandibular joint may be considered a direct cause of deafness and nerve involvement and groups who do not believe that such direct action does take place.

One can but conclude that the relationship between condylar joint function, head pain, tinnitus and deafness is obscure and agree with the author's conclusion that our aim at the moment at least should be to provide an occlusion as satisfactory as possible to avoid an upset to the condylar joint environment.

In any oral reconstruction the problem that most besets the operator is the determination of the most satisfactory vertical dimension that should be maintained, not only from the aspect of clinical procedure but moreover from the aspect of permanency and comfort to the patient. That this problem can only be satisfactorily determined by particularly careful examination and study is exemplified by the wide field covered in this text to illustrate factors influencing the formation of an occlusion. The orthodontic and periodontic influences may be harnessed to simplify a procedure while on the other hand ignorance or failure to take into account their effect must jeopardise the result. It must be realised that reconstruction of occlusion is not always in the best interests of the patient, whether it be because of the age, the muscle habits, the ridge relationships or the condition of remaining teeth. The clinical evidence presented shows this most clearly.

All that has been written on occlusal relationship in reference to oral rehabilitation must apply equally to all types of partial denture prosthesis and for that reason alone this section would merit study.

The chapters dealing with the clinical procedure call for very careful examination. Provided the operator is willing to work carefully oral reconstruction as illustrated should be within the scope of most. To overcome the difficulties possibly enforced by the lack of the more modern types of fully adaptable articulators, functional techniques also are described.

One cannot but be impressed by the enormous amount of research necessary for the compilation of a text of this nature, but more impressive still is the wealth of clinical experience portrayed. For Schweitzer has shown no special preference for any one technique, rather selecting one to favour the conditions of the patient.

The fact that he is able to show that the occlusion is functional ten to fifteen years later speaks for itself.

This book is a welcome addition to dental literature in that it summarises adequately the position of temporomandibular dysfunction, explores the ramifications of occlusion and describes many interesting techniques for restoration of the occlusion.

Extensive bibliographies following each chapter make this a text most valuable for any searching for further information on any of the subject matter presented.—*C. H. Graham.*

AUSTRALIAN SCIENTIFIC SOCIETIES AND PROFESSIONAL ASSOCIATIONS, by G. J. Wylie and Nona F. Lowe, Commonwealth Scientific and Industrial Research Organization, Documentation Section, Melbourne, 1951. *Our copy by courtesy of the C.S.I.R.O.*

The Commonwealth Scientific and Industrial Research Organization has published a most useful and informative directory giving details of the aims, objects and publications, membership, history and the nature of any awards or research funds of these societies.

The societies and professional associations classified are in the pure sciences, technology, medicine, dentistry, primary industry, and to some extent the social sciences.—*N. D. Martin.*

ANTISEPTIC
DETTOL
NON-POISONOUS GERMICIDAL

The antiseptic you use.....

If it is 'Dettol,' it is efficient, non - poisonous, non - staining, pleasant and deodorant.

The germicidal efficiency of 'Dettol' remains high even in the presence of organic matter.

This property, coupled with its wide margin of safety, makes 'Dettol' invaluable for use in dental practice.

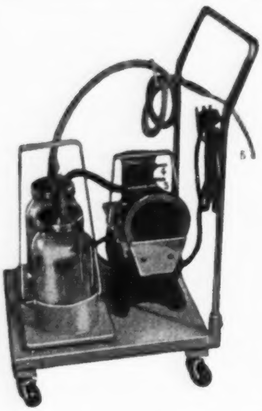
'Dettol' destroys germs, but is gentle to tender human tissue.

DETTOL

REGD.

The Modern Antiseptic

5625



CLEMENT'S ELECTRIC ASPIRATOR

(SUCTION UNIT)

MOUNTED ON TROLLEY

For Use in Exodontia and Oral Surgery

Adequate Suction necessitates the removal of large quantities of air to maintain sufficient negative pressure to be effective.

Quietness and Long Life necessitate slow-moving parts.

This pump fulfills the above requirements, as it has **large capacity, 40 litres of free air per minute, high vacuum, 29.7" H.G.,** and **low speed, 350 r.p.m.**

Vacuum Control can be fitted if required, so that suction can be set to any required degree, from the gentlest suction up to 29.7" H.G.

ADVANTAGES IN USE

Sponging with consequent risk of traumatization is eliminated.
Visibility of operative field is maintained by rapid removal of blood, saliva, etc.
During anaesthesia, rapid removal of debris is essential to eliminate risk of inspiration of foreign matter into the lungs.

H. I. CLEMENTS & SON

XB 3492. **62/64 Pacific Highway, St. Leonards, Sydney.**

Faulding's

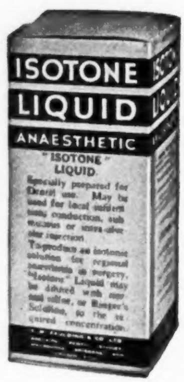
ISOTONE LIQUID

Clinical demonstrations have shown Isotone Liquid to fulfil our expectations.

Reports from practitioners throughout the Commonwealth speak highly of its rapid and profound anaesthesia with total absence of toxosis and unpleasant post-operative troubles.

Isotone Liquid possesses all the qualities of a freshly prepared solution, and its self-sterilising non-toxic base ensures its keeping properties.

Isotone Liquid represents 2% Procaine Hydrochloride, 1-40,000 Adrenalin Chloride in an isotonic isoionic (pH 6.5) self-sterilising base.



2-oz. Vacuum Sealed Bottles

Less 10% for 1 dozen bottles.

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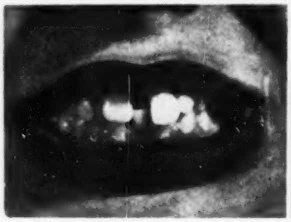
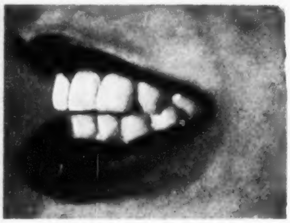


before treatment,

after treatment.

before treatment,



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